

THE STORY OF SITTING WHITE EAGLE | FEATHERED DINOSAURS

# ROTUNDA

THE MAGAZINE OF THE ROYAL ONTARIO MUSEUM

volume 37: number 3  
2005 spring

## Paleontological Potpourri

*Slug trails, pincushion trilobites, and peculiar sea lilies  
are among the fossilized treasures recently enlisted  
in telling the story of life before the dinosaurs.*

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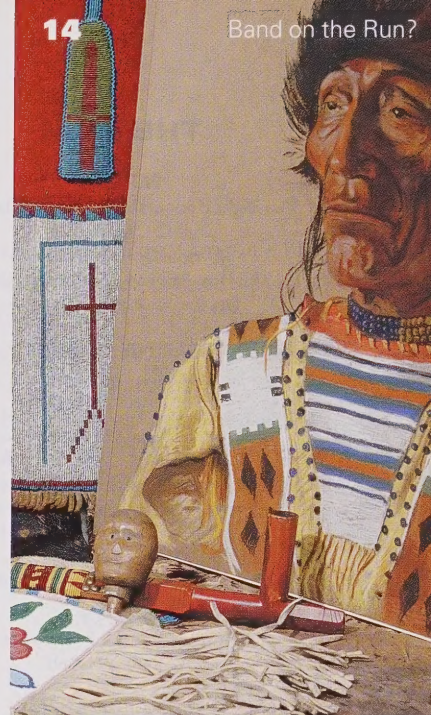
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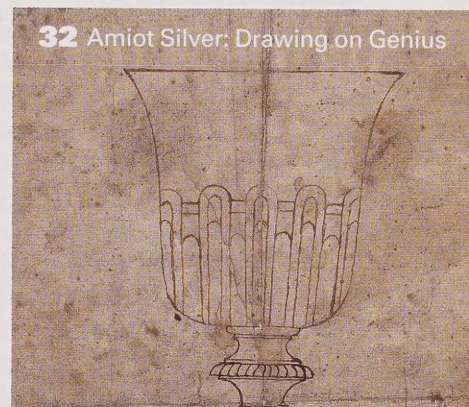


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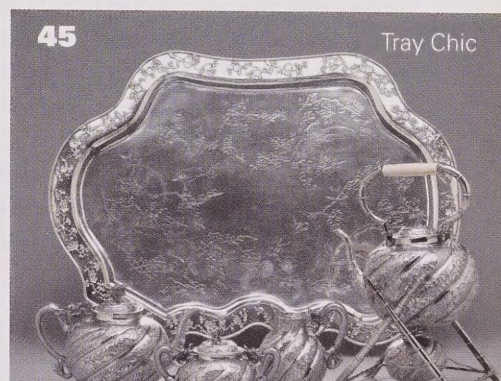


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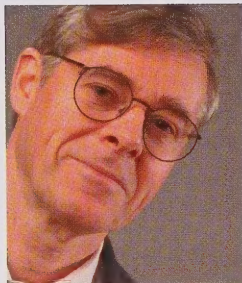
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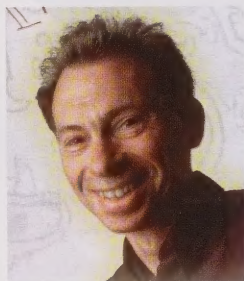
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*Canadian Section, ROM's Department of  
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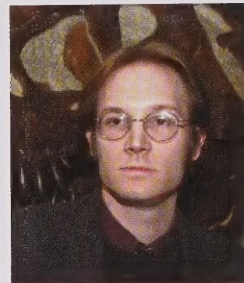
**A**S THE ROM's associate curator of Canadian Historical Decorative Arts, Ross ("Silver Standard") works with silver, furniture, ceramics, and glass. His special research interests include Loyalist artifacts, early immigrant craftsmen to Canada, and imported ceramics. Currently he is writing a book that traces the history of Canadian silver.



### Arni Brownstone

*Anthropology Section, ROM's Department  
of World Cultures*

**B**ORN IN REGINA, not far from where Sitting White Eagle's story takes place, Arni ("Spirit of the Plains") began working in the ROM's Anthropology Department in 1974. His main scholarly pursuit is the study of Plains Indian painting. Currently, he is involved in Renaissance ROM plans for the Plains Indian section of the Canadian First Peoples Gallery, and the Americas section in the Michael Lee-Chin Crystal. The new Canadian First Peoples Gallery will feature the Edmund Morris Collection, including the objects mentioned in the Sitting White Eagle story.



### Dr. Thomas Carr

*Carthage College*

**T**HOMAS ("Non-birds of a Feather") obtained his Ph.D. in vertebrate paleontology in the Department of Zoology at the University of Toronto under the supervision of Dr. Chris McGowan, a world expert on ichthyosaurs. Thomas's dissertation focused on the evolution of *Tyrannosaurus rex* and its closest relatives, and included the description of two new tyrannosaur species. With co-author Dr. Thomas E. Williamson, curator of paleontology at the New Mexico Museum of Natural History and Science, Thomas recently published a scientific article in the *Zoological Journal of the Linnean Society* detailing the growth changes in the skull of *T. rex*.

Thomas is presently an assistant professor of biology at Carthage College on the sparkling western shore of Lake Michigan in Wisconsin. He is in the early planning stages of developing a strong undergraduate program in vertebrate paleontology to complement his research program at Carthage College. In 2000, Thomas's interest in the big picture of theropod evolution led him to China, where he visited the collection sites of the feathered dinosaurs and was able to study some of the specimens at the Institute of Vertebrate Palaeontology and Palaeoanthropology in Beijing.

**CORRECTION** The Winter 2004 / 2005 issue of *Rotunda* should have been listed as Volume 37, No. 2, not Volume 38, No. 2 as printed.



## ROM MESSAGE

**M**ANY PEOPLE ASK what proportion of a museum's collections is exhibited to the public, and whether a museum's expansion will substantially increase that proportion. The answers at the Royal Ontario Museum will always be "a small minority" to the first question and, for Renaissance ROM, "very substantially indeed" for the second.

Collections in large museums include many objects that are important for research and conservation but are not very suitable for public display. The ROM may have 50,000 bats, or hundreds of pottery vessels from the Mediterranean, all important for study and preservation. But only a few may be relevant to public display or necessary to represent the rest—thus the "small proportion" on exhibit at any given time.

Of course, space itself creates an important constraint. The ROM's collections of cultural artifacts and specimens from the natural world amount to some 5 million objects. Of these, perhaps a million could be displayed, and of those perhaps 40 percent would be of display quality and interest. These numbers simply speak to the depth and various purposes of a great museum's collections, of which public exhibition is one of several.

That said, the ROM's current expansion project will dramatically increase both the number and nature of the collections on public display. There will be 20 new permanent galleries in renovated and new space, amounting to some 13,950 square metres (155,000 square feet). And total gallery area will increase by some 3780 square metres (42,000 square feet) to 20,250 square metres (225,000 square feet), which

places the ROM among the largest exhibiting museums in North America.

The most dramatic evidence of change will come in the appearance of entire collections that have not seen permanent galleries for many years—or ever. The creation of permanent galleries for these "stranded collec-



BRIAN BOYLE, ROM

tions" will effectively bring new museums to Ontario and Canada within the ambit of the ROM.

The Phase One Heritage, opening next December, will include our first Gallery of Japan, named after the late Prince Takamado of Japan (who studied at Queen's University). This gallery draws from some 6000 items in the vault, including paintings, screens, ceramics, armour, and textiles, and will be located in the original wing facing Philosophers' Walk. In addition to the gallery, the Japan Initiative seeks to raise funds to endow a curator and annual public programming for Japan.

Also opening in December is the new Gallery of Canada: First Peoples, in the Weston Heritage Building facing Queen's Park. This will reach into a collection of some 20,000 objects

of art and culture from Canada's First Peoples, which has not had a permanent gallery at the ROM for more than a generation.

Our new Chinese galleries will include the first Gallery of Chinese Architecture in the West, including the Ming and Han tombs, many individual architectural elements, and a wooden temple fragment reproduced directly by Chinese artisans from a temple in Beijing.

Later through 2006, other stranded collections will be unveiled in new permanent galleries: Canadian historical art, costume and textiles, Early Life (including the Burgess Shales), Cyprus, Africa, the Americas, and Asia Pacific. There will be a new gallery of 20th-Century Design. And the recreated galleries of South Asia, the Near East, Rome, Byzantium, Nubia, dinosaurs, evolution, and early mammals will all contain expanded collections.

In the end, objects on display at the ROM will grow by some 50 percent through Renaissance ROM, all of them in new permanent galleries. The proportion of the ROM's total collection on exhibit will remain quite small, but the diversity and volume of the exhibits themselves will grow dramatically.

In all this, it is our curators, conservators, preparators, and mount-makers who are working at a furious pace with Haley Sharpe Design of the United Kingdom to produce an unprecedented expansion in only four years. This will bring the ROM forward again as one of the leading international museums in the world, where it belongs.

*William Thorsell is director and Chief Executive Officer of the Royal Ontario Museum.*





BRIAN BOYLE, ROM / M51710

## Starry Sight

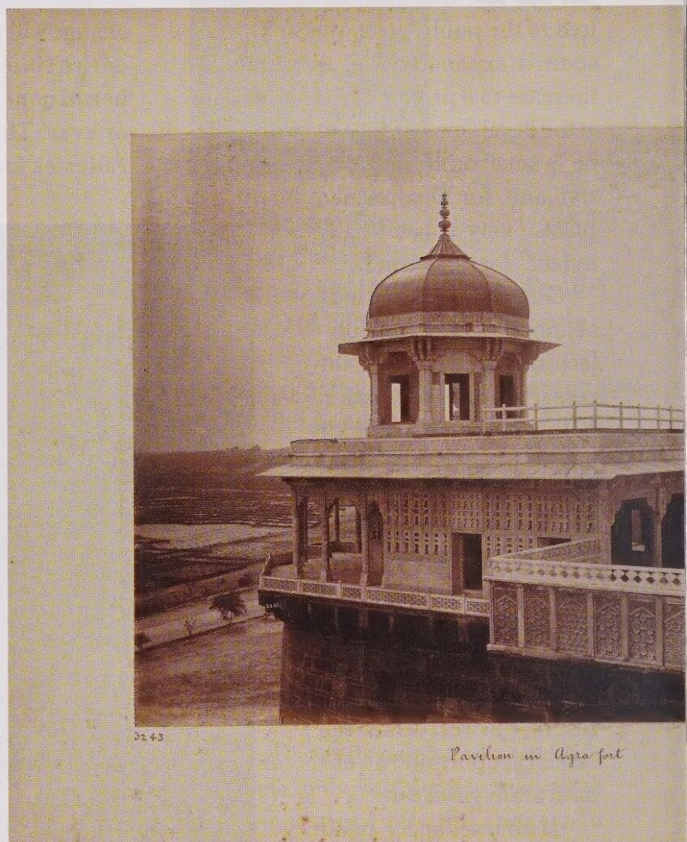
*Remarkable crystals of rutile and hematite*

**A**SPECTACULAR NEW FIND of rutile and hematite mineral specimens was made in February 2004 at the Novo Horizonte locality in Bahia state, Brazil. The ROM was fortunate to be able to acquire this specimen thanks to a grant from the ROM Foundation. This world-class specimen will be on display in the forthcoming Inco Limited Gallery of Earth Treasures.

Rutile and hematite were first found in this Brazilian locality in the early 1980s. This latest find is particularly important because for the first time the mineral crystals are still attached to the underlying rock matrix. The association of crystals and matrix provides a better understanding of the environment in which the crystals formed.

In this 20-cm (7.8 inch)-long specimen, golden crystals of rutile, a titanium oxide, appear to grow from plates of the silvery-black hematite, an iron oxide. Looking carefully at the crystal groups, one can see that the rutile crystals form six-rayed stars, with hematite plates at their centres. This is a classic example of a phenomenon known as epitaxial growth. Hematite crystallizes with hexagonal symmetry (trigonal subsystem). The rutile crystals, although themselves crystallizing with tetragonal (four-fold) symmetry, followed the atomic structure of the hematite as they grew, creating these spectacular star-like groups.

—Malcolm Back



BRIAN BOYLE, ROM / 2004.31.1.3

## India Through the

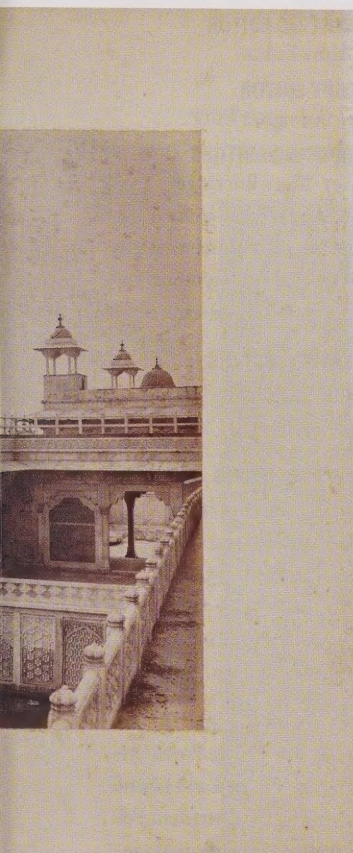
*Late-19th-century images reveal the beautiful*

**P**HOTOGRAPHY WAS invented in the late 1840s, and albums such as the one pictured above became part of tourist culture—compiled by European visitors and carried home as a souvenir of their travels. The album of sumptuous Indian photographs dating to the late 19th century was recently acquired by the ROM through the generous support of the Louise Hawley Stone Charitable Trust. It contains 92 albumen prints

of architectural monuments throughout northern India at sites such as Agra, Delhi, Chittor, Jaipur, Ajmer, Ahmednabad, Bombay, Sanchi, and Khajuraho.

Most intriguingly, the ROM album contains photographs taken by renowned photographer Lala Deen Dayal (1844–1905), who came from a Jain family of jewellers. Trained as a draftsman, Dayal quickly turned to photography and established his reputation by working





2004.31.1-92

Left: Deen Dayal,  
Pavilion at Agra Fort  
(Neg no, 3243),  
Albumen print.  
Above: views of  
album open  
and closed.

## Camera Lens

*work of the Bold Warrior of Photography*

with the elite of the time, including the Maharajah of Indore and the Prince of Wales. In 1885, he was appointed court photographer to one of the richest men in the world, the Nizam of Hyderabad, who bestowed on Dayal the title of Raja Bahadur Mussavir Jung, literally "Bold Warrior of Photography." One of the most famous of early photographers in India, Dayal won many medals for the technical excellence and aesthetic beauty of his photographs.

In the late 19th century, Europeans were fascinated with Indian architecture; it represented the exotic as well as India's long history of diverse cultural traditions. Early photographs such as those in the ROM album played a role in establishing international interest in certain monuments, many of which, such as the Taj Mahal and Sanchi Stupa, remain tourist destinations today.

—Deepali Dewan



BRIAN BOYLE, ROM / 56793

## Marvellous Molluscs

*An ancient opalized mollusc community*

**C**OOBER PEDY, in the Eromanga Basin of central South Australia, is world famous for the fabulous opals it produces. Not so well known is that some of the fossils preserved in Coober Pedy rocks, especially molluscs, are replaced by precious opal, giving the fossils the vivid colours of the rainbow in strong white light. The ROM has a few of these molluscs, acquired to display the process of replacement in fossilization, and for their beauty.

At the 2004 Tucson Rock, Mineral and Fossil Show, for the first time, molluscs opalized in their living positions were offered for sale. The slab shown here is of a 125-million-year-old mollusc community—mussels, clams, and snails—preserved in their living positions on the sea floor. Sometime later, probably between 70 and 60 million years ago, the calcareous shells of the molluscs were replaced by silica in the form of precious opal. The slab was purchased with the aid of the ROM Foundation: Fossils Fund.

So now we can see how molluscs lived on the sea floor 125 million years ago, and enjoy their beautiful colours.

—Des Collins



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## The Black Fly



*Entomology curator Doug Currie gives an  
account of his research on Arctic black flies.  
How did these bloodsucking pests become a  
dominant feature of the Arctic landscape, and  
what can they tell us about environmental  
changes due to global warming?*



ROTUNDA



## GROWING COLLECTIONS

# PALEONTOLOGICAL POTPOURRI

*Slug trails, pincushion trilobites, and peculiar sea lilies are among the fossilized treasures recently enlisted in telling the story of life before the dinosaurs.*



BRIAN BOYLE, ROM / 56754

**T**HE YEAR 2007 may seem a long way off, but when you're a paleontologist planning a gallery of fossils that spans nearly 4 billion years of life history, two years is a vanishingly short time. A new Renaissance ROM gallery with the working title "Earth and Early Life" is slated to open on the second floor of the northeast wing of the 1931/1933 Heritage Building. That particular space has long been the home of

the Museum's vertebrate paleontology galleries, including the ever popular dinosaurs. But after most of the vertebrate fossil displays are shifted into the brand-new Michael Lee-Chin Crystal

DAVE RUDKIN

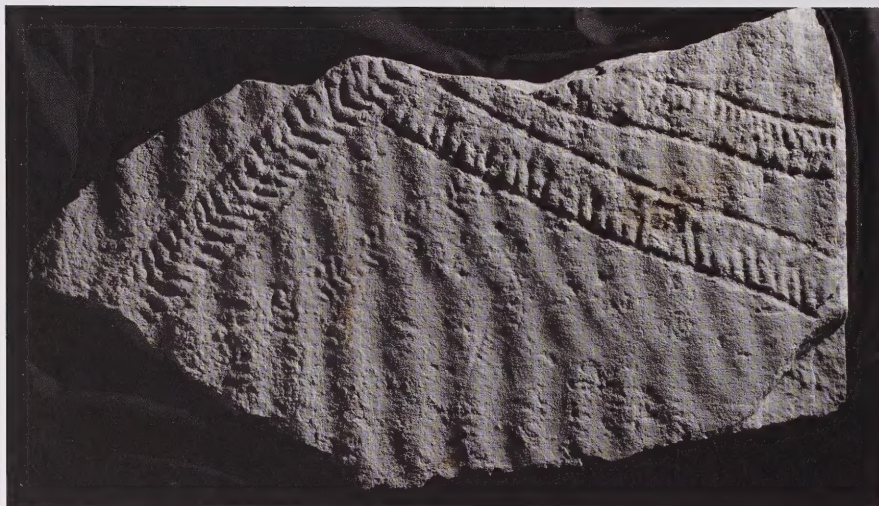
in a year or so, the wing will be renovated to showcase the vast panorama of life before the dinosaurs.

*Scyphocrinites* species—Silurian-Devonian sea-lily fossils from Morocco. Slab 80 cm (31.2 inches) across. Purchased with the generous support of the Louise Hawley Stone Charitable Trust.

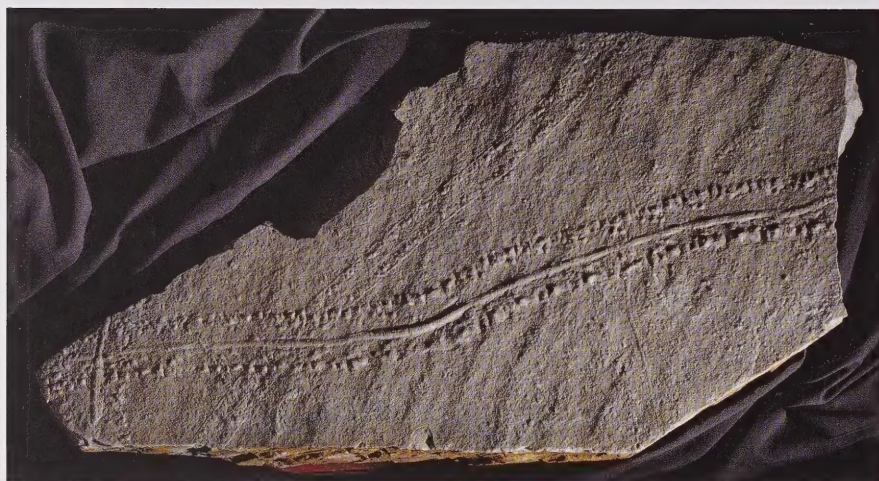
Compressing most of the story of life on this planet—from the earliest aquatic microbes to the rise of the ruling reptiles—into such a comparatively small area is a daunting challenge. One of the absolute delights of the task, however, has been the opportunity to



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acquire new and spectacular display specimens. Over the past year, my colleagues and I have added some truly noteworthy fossils to the ROM's superb collections, mostly through the generous support of the Royal Ontario Museum Foundation and the Louise

Hawley Stone Charitable Trust.

One of our most intriguing acquisitions is a collection of white quartz sandstone slabs bearing the imprints left by marine invertebrate animals as they glided and walked across a rippled sandy sea floor about 490 million

**Top:** *Climactichnites wilsoni*—grazing trails of unknown soft-bodied animals. **Middle:** *Protichnites ichnospecies*—one main trackway and several fainter traces. Top and middle from Cambro-Ordovician of southern Quebec—both slabs 80 cm (31.2 inches) across. **Bottom:** *Koneprusia species* (left) and *Hollardops species*, 6 cm (2.3 inches) long—trilobites from the Devonian of Morocco. Purchased with generous support from the Louise Hawley Stone Charitable Trust.

years ago. Although their bodily remains and shelly hard parts have not been preserved, the record of their activity is captured in stone in these complex "trace fossils." Looking for all the world like petrified tire tracks, the bizarre traces known as *Climactichnites* have been interpreted as trails made by soft-bodied, slug-like animals grazing on bacterial films growing on the shallow seabed.

Accompanying *Climactichnites* on many of the sandstone surfaces are walking trails of very different kinds of animals. The most common type, called *Protichnites*, consists of two parallel rows of "footprints" symmetrically disposed on either side of a central groove; these have been attributed to such extinct arthropods (the "joint-footed" invertebrates) as trilobites and distant cousins of the modern horseshoe crabs. Our specimens came from a large commercial quarry near Havelock in southern Quebec; they were acquired from collector Pierre Groulx by purchase and through a generous donation.

More conventional and, to most people, more familiar kinds of fossils are the mineralized shelly components of ancient sea-dwelling animals. Although these are typically found as disjunct fragments of only the more robust bits, complete and highly delicate remains have sometimes survived the vicissitudes of death, burial, and subsequent lithification (literally, "turning to stone"). Some striking examples of surviving fragile hard parts come from Devonian limestones in the Anti-Atlas region of Morocco. There, an amazing suite of 400-million-year-old trilobites—many showing arrays of warty



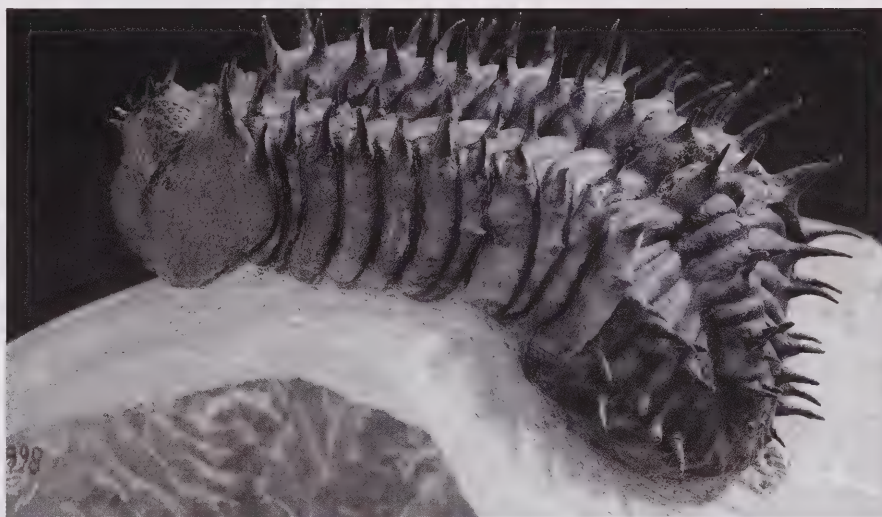
**Top:** Numerous specimens of *Jimbacrinus bostocki*—odd crinoids from the Permian of Western Australia. Slab is 45 cm (17.5 inches) across. **Bottom:** *Drotops armatus*—a spiny trilobite, 12 cm (4.7 inches) long, from the Devonian of Morocco. Top and bottom purchased with generous support from the Louise Hawley Stone Charitable Trust.

protuberances, exquisitely slender spines, or narrow blades—is preserved in full three-dimensional relief. It takes a great deal of knowledge, patience, and expertise to expose such remains safely, but in the hands of a skilled preparator, these fossils seem almost to come alive. We were most fortunate this past spring to acquire a superb collection of 20 fully prepared Moroccan trilobite specimens, including 15 elaborately spinose Devonian-age wonders. Along with our historical collections and other recent acquisitions (see “Growing Collections—Fossil Superstars” in the Summer/Fall 2004 issue of *Rotunda*), these fossils will form the core of a feature exhibit on trilobites in the new gallery.

We have also been actively searching for some splendid new display specimens for a significant group of marine fossils called the crinoids, or sea lilies. Crinoids are relatives of sea stars, sea urchins, sea cucumbers, and a variety of other animals that together comprise the echinoderms, or “spiny-skinned” invertebrates. Although some crinoids live in present-day seas, these animals were far more diverse and important in ancient marine environments. Their fossil remains can be extraordinarily abundant, but typically consist only of disarticulated elements of the complex mineralized “skeleton.” When complete crinoid fossils are found, it is easy to understand how they came by their vernacular appellation “sea lily.” With a long, narrow stalk that served to tether a flower-shaped body (calyx) and feathery feeding arms above the sea floor, these creatures look deceptively plant-like. Our recent purchases include two kinds of aberrant fossil crinoids. A lovely slab of red limestone from Silurian-Devonian strata (about 416 million years old) in Morocco (again!) contains



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10 large calyces and many articulated stalks of the crinoid *Scyphocrinites*. Some paleontologists have suggested that *Scyphocrinites* lived suspended upside down in the water column, hanging beneath a bulbous float.

Our second crinoid acquisition includes two blocks of tan-coloured sandstone from Permian beds (approximately 280 million years old) in Western Australia. The blocks have been prepared to reveal about 20 specimens of *Jimbacrinus*, a very odd form with a spherical calyx armed with stout spines, coiled, snake-like feeding

arms, and a stalk that lay recumbent along the sea floor. Visitors invariably comment on the bizarre appearance of *Jimbacrinus*, noting its potential to star in a science fiction film!

Even as 2007 draws closer we will continue to seek and acquire exciting new fossils to help us illustrate the story of “Earth and Early Life.” Stay tuned for more additions to our Growing Collections.

*Dave Rudkin is assistant curator of Paleobiology in the ROM's Department of Natural History.*



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## THE ARCHITECTURE OF LIGHT

FEATURE REVIEW

**Breaking Ground:  
Adventures in Life and Architecture***Daniel Libeskind*  
(Penguin, Cloth: \$40)

A PROFOUND OPTIMISM infuses the vision of megastar architect Daniel Libeskind, albeit an optimism forged in adversity—his parents were interned in Gulag forced-labour camps, his father was incarcerated on spurious secret police charges, his mother eked out a grim life in textile sweat shops. Despite or perhaps because of this, the architect's work is filled with light. "Architecture," he writes, "is built on faith." He quotes Hebrews 11:1: "Faith is the substance of things hoped for, the evidence of things not seen," and recalls his architectural pilgrimage to the Sanctuary of the Holy House in Loreto, Italy, where he was astonished to learn that the "baroque curves cut into the floor of the shrine" were in fact the cumulative indentations made by the knees of centuries of worshippers. "The power of faith to transform even stone," he reflects, "was a lesson I have never forgotten."

Libeskind has led a nomadic life, having moved 14 times in 35 years, and this has no doubt contributed to his cosmopolitan perspective and the broad appeal of his work. *Breaking Ground* is his story, from his earliest years in Lodz, Poland, to his winning designs for the World Trade Center site. It is also a statement of his aesthetic philosophy.

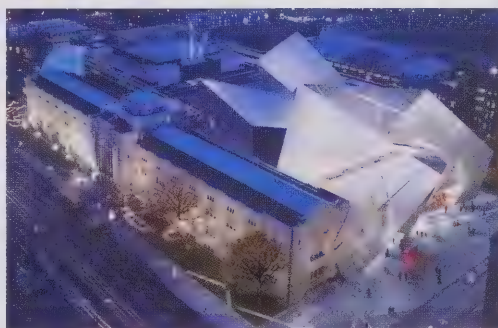
Light is the basis of Libeskind's art. At Chartres cathedral he was awed by the stained-glass "chords of light": "The coral and red fall on the columns and on the floor.

You want to pick them up. Light transforms colour into substance." In Libeskind's palette, light is divine. His Jewish Museum in Berlin includes a void symbolizing loss, but "high in the ceiling, and angled so acutely that you can't see it, is a slit that lets in a line of light," an affirmation of hope. This concept of light emanating from an unseen source is poetically expressed by philosopher and Nobel Prize winner Henri Bergson, cited by the author: "Dreams are luminous, filled with light, and yet they happen without any optical or measurable light. They offer us a promise of eternity."

The Royal Ontario Museum's Libeskind-designed Michael Lee-Chin Crystal, the jewel in the crown of Renaissance ROM, will interact with light and atmospheric conditions to create a myriad of hues and tones. It will be a massive edifice—like a slice of the Canadian Shield lit by the aurora borealis, a metaphor of the North.

In counterpoint to his high-profile work in titanium, glass, aluminum, and steel across museums, galleries, and corporate cathedrals, Libeskind has carried with him (through all 14 moves) a small iconic symbol of beauty, a mounted butterfly, with phosphorescent wings of a deep indigo, a gift he received from an aunt in Brazil when he was seven. He writes: "It was one of the most beautiful things I had ever seen, and certainly one of

the few objects of beauty we had in Lodz. In those wings that glowed with an almost radioactive light I could see almost everything I needed to know about Rio de Janeiro, about nature, cities, light, the afterlife, eternity."



STUDIO DANIEL LIBESKIND

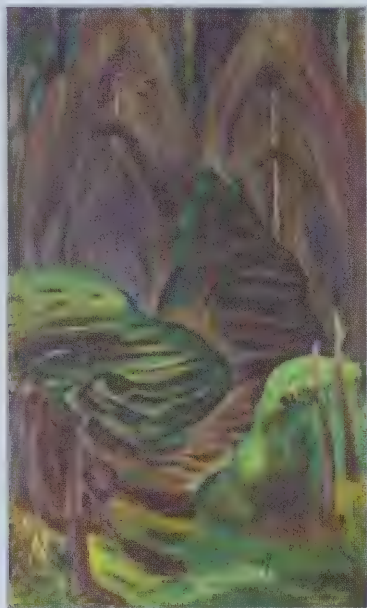
*It will be a massive edifice—like a slice of the Canadian Shield  
lit by the aurora borealis, a metaphor of the North.*

SELECTED AND REVIEWED BY GLEN ELLIS



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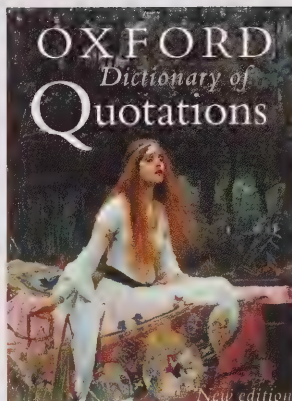


## Fashion: A Canadian Perspective

Alexandra Palmer, ed.  
(University of Toronto Press,  
Cloth: \$75, Paper: \$35)

THE ROYAL ONTARIO MUSEUM'S Nora E. Vaughan Fashion Costume Curator, Dr. Alexandra Palmer, has assembled a collection of authoritative essays, each of which illuminates a historical or current topic of Canadian fashion. Eileen Stack's essay about the Canadian blanket coat, for example, with specific reference to the Montreal Snowshoe Club between about 1840 and 1890, reveals a costume which, when combined with the habitant *tuque bleu*, derived both from native and French-Canadian cultures to create a distinct Anglo-Canadian garb. Jan Noel's essay chronicles the de-frilling and decolourization of men's attire in Montreal between 1700 and 1867, paralleling an increasing association of sobriety and responsibility with the "man in black."

The illustrations are always judiciously selected to enhance the texts. Christina Bates's essay about the Ontario millinery trade between 1870 and 1930, for instance, visually telegraphs the dramatic shift from the Edwardian woman's upswept hair and elaborate hat perched on top to the mid-1920s *cloches*, helmet hats that partially hooded the eyes and were worn in tandem with close-cropped bobbed hairstyles. Peter J. Laroque's essay about female garment workers in urban 1871 New Brunswick reveals the impact of the newly perfected sewing machine, for better or worse, on young women's lives. Barbara E. Kelcey recounts dress



reform in mid-19th-century Canada, and its effort to free women from form-contorting styles and apparatus.

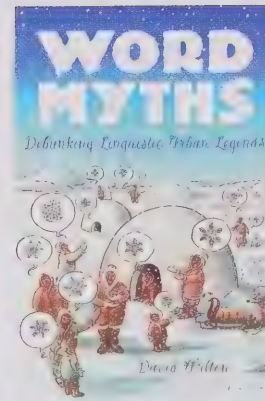
All the essays are excellent, and there isn't space here to comment on all of them, but other notable entries are Susan Turnbull Caton's contribution about Canadian women's fashion during WWII; Alexandra Palmer's about the Association of Canadian Couturiers; Deborah Fulsang's "The Fashion of Writing, 1985-2000"; and Eaton's "Prestige Advertising," published in the *Montreal Gazette* between 1952 and 1972. The ads won more than a hundred awards and garnered accolades from such far-flung locales as New York, Palo Alto, Zurich, and Tokyo. (An August 1962 ad reveals an artistic ideal of tall, slender, dark-haired women with wide mouths and wide-set eyes, a nod to the iconic young fashion plate Jacqueline Bouvier Kennedy.)

An important contribution to the literature, *Fashion* is both erudite and entertaining, an incisive study of the multi-layered impact of fashion on Canadian society.

## The Oxford Dictionary of Quotations, Sixth Edition

Elizabeth Knowles, ed.  
(Oxford, Cloth: \$79.95)

THE OXFORD DICTIONARIES can usually be praised in superlatives, and the current volume is no exception. More than 20,000 entries are included, from ancient Egypt to the 21st century. Authoritative, entertaining, and enlightening—in short, a masterpiece. Herewith, a selection of quotes: "I will not be triumphed over" (Cleopatra,





69–30 BC); “Run slowly, horses of the night” (Ovid, 43 BC–c. AD 17, *Amores*); “Beauty is power” (Helena Rubenstein, 1882–1965); “If I’d known I was gonna live this long, I’d have taken better care of myself” (ragtime pianist Eubie Blake, 1983, on reaching age 100); “The world has achieved brilliance without wisdom, power without conscience. Ours is a world of nuclear giants and ethical infants” (Omar Bradley, 1893–1981); “I will return. And I will be millions” (inscription on the tomb of Eva Peron, 1919–52); “Never play cards with a man called Doc. Never eat at a place called Mom’s” (Nelson Algren, 1909–81).

### Word Myths: Debunking Linguistic Urban Legends

David Wilton

(*Oxford, Cloth: \$27.95*)

THE “WORD MYTHS” under attack here include “posh” as an acronym for “port out, starboard home” and the lexicon of “500 Eskimo words for snow.” The author often concedes, however, that many of the myth-related

words have no satisfactory etymology, so perhaps legend has been substituted to satisfy the need for an explanation, any explanation, even if false. The cartoon cover of the book depicts snow falling over traditional Inuit igloos. Each Inuk pondering the snow utters a different snowflake-shaped pictogram. Even the sled dog is thinking snow, if not barking it. I have heard that the arctic languages contain many snow words, although I had not previously encountered a claim of 500. To try to get to the heart of the matter, I contacted a Royal Ontario Museum author, John MacDonald, who compiled *The Arctic Sky: Inuit Astronomy, Star Lore, and Legend* from his interviews with Inuit elders. John lives in Igloolik, Nunavut, on approximately the 70th parallel of latitude, and is a student of Inuktitut. (A Scot, he plays the bagpipes on Burns Night but quips that no one actually hears the music until the pipes thaw on Canada Day.) He reports that some years ago he made a list of “snow and ice terms gathered from various Eastern Canadian Arctic

Inuktitut dialects” for a book called *Touching North*, by Andy Goldsworthy. Subsequently, he writes, someone extracted the 31 “snow words,” adding some Finnish words for snow, and posted them on the Internet (among similar sites). While arctic snow words are indeed multitudinous, each nuances a textural difference in the substance, e.g., *masak*, meaning “saturated snow” and *quiasuqaq*, meaning “refrozen snow surface, making crust.” Ultimately, David Wilton also concedes that there are many, but he finds this “utterly unremarkable.” I think that he may be on thin ice (*sikusaak*) here. The sheer number of snow words as well as the amount of detail contained in each is, I think, utterly remarkable. That said, the author is normally on terra firma (*nuna*), and *Word Myths* has much to recommend it. Above all, it will encourage a healthy skepticism of oral and cyberpop etymologies.

Glen Ellis is head of Publications, Royal Ontario Museum.



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Sitting White Eagle, charismatic medicine man and warrior, and his fellow Plains Indians endured massive changes after 1880. A portrait of the times in southern Saskatchewan.



## BY ARNI BROWNSTONE

WHEN HE WAS A YOUNG MAN, Sitting White Eagle—a Plains Indian warrior and medicine man who was born in 1840—and several of his band members were captured by a group of Peigans, of the Blackfoot Nation. The Peigans had encamped all around their prisoners to prevent escape. But the men managed to consult with Sitting White Eagle, and he told them to do as he said. The fire still lingered. Under the moonlight, he rose with

his blanket about him and walked in a straight line through the Peigan camp, his men following in his footsteps. Not one Peigan saw them. As soon as they were out of distance of the camp, Sitting White Eagle told them to run for their lives.

This story is recounted in a diary of Canadian artist Edmund Morris, who in June 1908 made his first of three visits to the Crooked Lake Reserves in Saskatchewan. Morris, under government

# SPIRIT OF





**Left** Sitting White Eagle holds the pipe bag and pipe collected by Morris. Edmund Morris, June 20, 1908. Cat. No. 98. Courtesy of the Manitoba Archives

**Above** Details of Sitting White Eagle's pipe bag. ROM HK2428

**Opposite page:** Sitting White Eagle's pipe and pipe bag. The pipe bag is an item of ceremonial regalia used to carry pipe, tobacco, and smoking paraphernalia. Gift of Edmund Morris HK210. Gift of Sir Byron Edmund Walker 912.40.4. Photography of all ROM artifacts by Brian Boyle, ROM

# THE PLAINS



**Below:** Sitting White Eagle is on the left, at the head of a mounted parade during treaty-time celebrations. Edmund Morris, June 20, 1908. Cat. No. 101. Courtesy of the Manitoba Archives



commission to draw pastel portraits of important Plains Indians, made the acquaintance of this "very astute old medicine man."

Another of Morris's diaries, along with more than 400 artifacts collected on the reserves, was bequeathed to the ROM shortly before Morris's death in 1913. In the ROM diary, the same escape from captivity is described to even greater dramatic effect, with "hundreds of Peigans" and the daring getaway taking place in "broad daylight."

Whichever version is true, the story suggests that Sitting White Eagle used supernatural powers to make himself and his comrades invisible to the enemy. These powers fell within the realm of what was expected of a medicine man. Sitting White Eagle, a traditional medicine man and charismatic Indian, was among the first generation to make the transition to life on the reserve. Tales and artifacts of his life during the old days remind us of an important period in Canadian history.

Sitting White Eagle was a Plains Indian, part of a vast community of nomadic peoples whose lives once centred on the movements of the buffalo over the Great Plains of North

America. Around 1870, it became acutely clear to Canadian Plains Indians that the great herds were on the decline, seemingly to be replaced by white settlers. In light of their future prospects, the Indians agreed to a series of treaties with the Dominion of Canada. These numbered treaties were signed between 1873 and 1877.

In 1880, after the buffalo herds disappeared, the Plains Indians made the difficult transition from a nomadic, hunting life to a sedentary one dependent upon agriculture and the provisions of the treaties—government food rations, equipment, housing, and medical help, as well as a small annuity payment.

As that transition was taking place, the discipline of anthropology in North American museums was in its infancy. Natural history museums, eager to preserve a record of the buffalo days before the people of that era passed away, sent field collectors to reserves to gather artifacts and cultural data. Over the next few decades, both New York's American Museum of Natural History and the Royal Ontario Museum collected artifacts from Sitting White Eagle. In 1913, the Government of Ontario transferred its collection of 58 Morris portraits, in-



**Below** Sitting White Eagle and friend (O'Soup?) standing before government-built log houses or "mud shacks." Edmund Morris, August 1910. Cat. No. 48. Courtesy of the Manitoba Archives



cluding one of Sitting White Eagle, to the ROM. The Manitoba Archives also holds more than 600 photographs, several of them of Sitting White Eagle, taken by Morris on his journeys. From these artifacts, paintings, and photos, as well as from written reminiscences of the day, we can reconstruct the history of this charismatic warrior and medicine man—and the cultural environment of southern Saskatchewan where he lived and worked.

Today, 161 kilometres (100 miles) east of Regina, with their southern borders parallel to the Trans-Canada Highway 11 kilometres (7 miles) away, sit the four adjacent Indian reserves of the Crooked Lake Agency. Running northward along flat prairie, the reserves fall off suddenly into the breathtaking chasm of the Qu'Appelle Valley, ending at the southern shorelines of Crooked Lake, Round Lake, and the connecting Qu'Appelle River. The first three reserves—Cowesses, Kahkewistahaw, and Ochapowace—are populated mainly by Plains Cree, while the fourth, Sakimay—where Sitting White Eagle lived—is predominantly Plains Ojibwa. The Crooked Lake Reserves are among those formed when the vast territory of south-central

Saskatchewan was ceded to the Dominion of Canada under the provisions of Treaty Four. That treaty was negotiated with Lieutenant Governor Alexander Morris in 1874 at Fort Qu'Appelle by leaders of the Assiniboine, Cree, and Ojibwa nations.

In the early days after the treaty was signed, the annual \$5 payment to each band member was the event of the year. Bands who had been dispersed for most of the year would converge for a week or more to renew friendships and celebrate their traditions. It was a time when the Indians once again felt masters in their own land. When Edmund Morris (the Lieutenant Governor's son) made his first sketching trip to Crooked Lake around June 20, 1908, it was treaty payment time.

Though treaty celebrations had been dampened after the mid-1890s by Canadian government regulations that prohibited Indians from holding traditional ceremonies, Morris convinced the Agent to permit a one-time traditional dance. At the event, Morris photographed Sitting White Eagle and collected his pipe and pipe bag.

Of the 10 photographs Morris took of Sitting White Eagle, one of particular interest shows him, unfortunately blurred,



**Buffalo calling banner collected by Morris in 1908, with tag in his handwriting: "Cree decoration for a rest used in lodges of the Chief and Medicine man." HD6868**



inside a tipi sitting on a Plains Indian device called a backrest. It is the only known historical photograph showing a special backrest decoration called a "buffalo calling banner."

The buffalo caller, or pound maker, was considered to be a medicine man in a class by himself. It was believed that he communed with the buffalo in his dreams and could induce a herd to follow his songs to their destruction. The 10 complete and four partial banners in existence consistently display beadwork imagery that seems to represent the calling of the buffalo herd into the pound, a circular wooden corral, hence the name pound maker. The three "U" shapes squared at their tops in the ROM example represent three pounds, the cross inside each signifying poles for holding the pound maker's sacred offerings, while the funnel shape represents the drive lanes, which would stretch 2.4 to 3.2 kilometres (one-and-a-half to two miles) into the prairie. The curious fact about the surviving buffalo calling banners is that they appear to be anachronistic—made soon after the buffalo herds' demise.

Five years after Morris's first visit to Crooked Lake, in June 1913, Alanson Skinner, curator of North American Ethnology at the American Museum of Natural History, spent some three weeks on the same reserves. In his field correspondence to his supervisor, Clark Wissler, he noted that the old timers were still always on the move. "They go to every re-

serve in Canada, drop down into the States to Sun Dance and visit everybody with red skin that they can find, and go, go, go, wintering anywhere they happen to be when the snow falls."

William Graham, the Inspector of Indian Agencies, wondered at their navigating abilities: "Before the days of railroads it was quite common to see old couples of 70 or 80 years of age, starting off by themselves with a team of ponies and wagon to go to Indian reserves hundreds of miles away in Montana. How they got there is a mystery to me, for as a rule, the tracks were not very distinct. Often they would drive over the prairies where there were no trails at all to be seen." These observations are curious since the government "pass system" was still in effect, meaning that Indians could not travel off reserve except for restricted periods and with written permission.

Skinner found that even when the bands were around, collecting artifacts was not necessarily easy. Of "old material there is none, for they bury everything with their dead," he complained. Indians did not have a tradition of preserving heirlooms in the manner of Europeans. Robert Jefferson, a teacher on Red Pheasant Reserve (1878–1884), noted that "relics" were wrapped with the deceased in red stroud or the best cloth on hand. Possessions not buried were given away "except for a small memento which [was] preserved centrally in the family, the accumulation of which is called a 'burden'." Despite Skinner's complaints, he was able to collect a "splendid Saulteaux [Ojibwa] suit in buckskin for a man," which turns out to have belonged to Sitting White Eagle.

This influential Indian was known in his own language as Wahpekinewap or sometimes Pahnap. "Pahnap" means "clean sitting"—clean in the sense of leading an exemplary life. Originally from the area of Lake Manitoba and Lake Winnipeg, Sitting White Eagle's father was a Plains Ojibwa, and his mother, a Swampy Cree, was a member of the Ojibwa band led by Peguis (Cut Nose Chief). That band sold its land to Lord Selkirk to establish the Red River Settlement in 1817, and from there the family must have moved southwest, onto the buffalo plains.

Sitting White Eagle was renowned both as a warrior and as a medicine man. In the 19th century, the Great Plains were the scene of intense inter-tribal warfare, and war and religion were inextricably connected. A warrior's success was believed to come from the efficacy of his medicine helper, or spirit power.

At an early age, boys or young men would prepare to become warriors by going on a vision quest to obtain supernatural powers, and by joining war parties as observers and helpers. Sitting White Eagle joined his first war party—against the Blackfoot—at the age of 12 as an observer.

During his lifetime he was in five battles with the Sioux, five with the Blackfoot, five with the Blood (a division of the Blackfoot), and five with the Crows. "At 20 he was in a fight," wrote Morris, "—one of the hostiles got shot through the leg and fled to his lodge. He followed him up & scalped him—for this he still wears a feather in his bearskin cap. The other feather is for another encounter—a Sioux levelled his gun at him. He threw his away & the Sioux did the same & both engaged with scalping knives. He killed the Sioux &



took his scalp. . . . He says the large black beads on his [shirt] stand for shots fired which took no effect—bulletproof!” Morris’s portrait of Sitting White Eagle (on page 20) shows him wearing both the cap and the shirt. The same shirt is part of the outfit collected by Skinner.

Taking a scalp while under fire of the enemy or killing a man in battle qualified an Indian as a brave. The most coveted piece of scalp was the scalp lock. Fur trader Alexander Henry observed in 1775 that young Swampy Cree men around Lake Winnipeg removed all their hair from their heads except for a spot on the crown the size of a silver dollar. They grew this clump of hair long, rolling and gathering it into a “tuft.” The tuft was considered an “object of greatest care.” Amelia Paget, who grew up in the Qu’Appelle Valley, noted a century later that although the men let their hair grow, they still decorated their scalp locks as “a sign of bravery, for it incited his foe.”

Although the scalp lock was most prized, a second, third, or fourth scalp could be taken by additional warriors from the same head. Night Bird (Nepahpenais), a contemporary of Sitting White Eagle from the neighbouring Cowesses Reserve, told Morris there was sometimes a rush to take a scalp in battle with “two or three swooping down with their knives. His hand was once cut in this way by the other’s knife.”

Henry Yule Hind, the head of an 1858 Red River expedition to assess the economic value of the prairie region, observed that victory celebrations in several Plains Ojibwa villages were focused around the capture of two Sioux scalps. The scalps were passed from hand to hand accompanied by dancing, feasting, and singing, then were returned to the warriors who suspended them “over the graves of relatives or friends mourning the loss of any of their kindred by the hands of the Sioux.” Killing was often an act of revenge against an enemy who had killed one’s own. Upon receipt of a scalp, those grieving the loss of a loved one were released from mourning.

Sitting White Eagle also told Morris details about victory celebrations. A successful war party, upon returning to camp, would blacken their faces with coal and lead grease, he said. When they were seen, a war cry would go up from camp and everyone would rush out of their tipis. A dance followed, the women donning the men’s war clothes. Skinner collected a charming Native drawing of two young Cree women from Crooked Lake dressed in men’s war bonnets, such as those worn at a victory dance.

The medicine man told Morris about another form of victory celebration: “Sitting White Eagle says it is true that the Saulteaux used to eat the Sioux killed in battle. He himself has done it—says they cut the flesh in narrow strips & let it slip down—says it is very rich.” Skinner questioned several Plains Ojibwa about this practice. All denied its existence except one.

In the 19th and early 20th centuries, the Plains Cree and Ojibwa were renowned for their potent medicine. Although they believed in an all-powerful Creator, they worshipped him indirectly through an intermediary, or medicine helper, which could be drawn from either living or inanimate sources. Each person would seek to establish rapport with a

**Below, Sitting White Eagle seated on a “buffalo calling banner” inside a tipi. Edmund Morris, probably August 1910. Cat. No. 47. Courtesy of the Manitoba Archives**



medicine helper through a vision, or “meaning dream.” The dream was made manifest in a medicine bundle composed of objects and ritual elements. Most people had some kind of medicine bundle that served to guide them during the course of their lives. Activated through ritual opening—which might include singing, prayer, body painting, and choreographed movements—the bundle established a rapport between the person and the supernatural power.

In some instances, a medicine bundle would contain a carving. Two such carvings were among Morris’s collection; they were found along the Yellow Quill Trail in 1878 and 1879. The first, a finely carved elk-horn figure, was found under the ground “in a box without nails” by a French settler. Traces of red paint cover the entire figure, with the colour particularly strong in the eyes and the heart. Sitting White Eagle explained to Morris why the figure would have been buried: “Either the medicine man who used it became too infirm to practice his art & having no one capable of succeeding him, he would bury it—or else it was bad medi-



From left to right: 1 Probably part of a marionette, the wooden head was found along the Yellow Quill Trail in 1879. HK 954  
2. This finely carved elk-horn figure is characterized by an elaborate conical headdress, which looks surprisingly like a bishop's

mitre. Holes at the sides probably once anchored horns. A small hole on top may once have held a downy feather. HK 956 (1 and 2 Gifts of Edmund Morris) 3. Sitting White Eagle was 70 years old when Morris made this pastel portrait in June 1908.



cine used against an enemy or one against whom he had a grudge, & when this man died or was killed, by reason of this image, the medicine man would bury it."

A Blackfoot (Peigan) chief named Little Plume owned a medicine figure in the 1890s. Walter McClintock, a dedicated student of Blackfoot culture who spent lengthy periods among the Blackfoot beginning in 1896, explained that "If [Little Plume] placed red paint between the eyes of the image, the one whom he desired to injure became ill; if over the lungs, he had a hemorrhage; if on the top of the head, he became crazy; if over the heart, it caused death." The ROM's elk-horn figure may have had a similar function.

But the magic was not always malevolent. The Plains Cree were known for their love medicine, or "sympathetic magic." Little wooden figures of a man and woman were bound together with some strands of hair of the one whose love was desired, then sprinkled with medicine. In 1934, Fine Day, the 80-year-old Cree Chief from the Battleford area, explained to anthropologist David Mandlebaum that a medicine man would put some medicine on a stick and touch the hearts of the love medicine figures.

The second carved figure in the ROM's collection is a round wooden head with glass beads for eyes. The stem below the neck suggests that the head may once have socketted into an articulated figure. This carving was found under the leaves along Yellow Quill Trail, perhaps placed there after a Mee-tah-win medicine dance, a dance for medicine men and their novices. Typically the dance ended with the giving of offerings to the Creator.

Sitting White Eagle's own powers as a medicine man rested considerably in his knowledge of plants. The Plains

Cree and Ojibwa believed, and to an extent continue to believe, that the Creator put plants on the earth to cure all manner of ills. A medicine man or woman almost always purchased or inherited his or her initial knowledge of plants, paying the elder to impart his or her knowledge. According to Morris, Sitting White Eagle bought his knowledge of roots from an old Saulteaux (Plains Ojibwa).

Curing illnesses typically also involved a ritual component—communing with one's intermediary—often accompanied by a rattle or drum. Around 1885, an elderly Cree explained the theory behind this: "When it has been very hot during the summer for days at a time, all the flowers, trees, and grasses droop and fade. Now to revive these the great Spirit sends the thunder and lightning and rain, and in a little while all nature is refreshed and lives again. He awakens them with his thunder, we try to awaken our sick with the [rattles] and drums, and at the same time give him medicine to drink, just as the great Spirit sends the rain to help drooping leaves and grass."

According to Morris, Sitting White Eagle was much sought after as a medicine man, even by white people who sometimes called on him. The caption that accompanies a portrait of the medicine man, now in the Saskatchewan legislature, includes the following statement: "After the advent of the white doctors the Indians, especially the young ones, did not patronize him very much." Nevertheless other testimonials suggest that Sitting White Eagle continued to be sought out by both Indians and non-Natives.

As late as 1930, Graham, the Inspector of Indian Agencies, recalled a conversation with Sitting White Eagle on board a CPR train: "He was a very old man with an otter skin folded about his head for a headdress and a coloured blanket over his



4. Sitting White Eagle's "war shirt" made of animal hide coloured with yellow pigment. 50.1/7371A. 5. A Cree drawing of two women dressed as in a victory celebration, wearing men's war headdresses. From the Crooked Lake Reserves



DENIS FINNIN, AMNH



around 1911. 50.2/6790 6. Sitting White Eagle's moccasins, with separate sole construction and typical "string of rectangles" motif. 50.1/7371D-E (4, 5, & 6. Courtesy of the Division of Anthropology, American Museum of Natural History)



shoulders. When he recognized me he became quite friendly and told me that he had received a message from an Indian far west, about 150 miles away. He wanted him to come as his two sons were ill with sore chests and were coughing very much." Graham knew the family well, and concluded that they were tubercular. The Department of Indian Affairs had a doctor caring for the Indians in that district, but it was common practice in cases where there was no apparent improvement under the white doctor to call in the medicine man. "I met the old man about a year afterwards," continued Graham, "and asked him how his patients were. He assured me that they had improved very much under his treatment."

In 1967 Alex Tanner, an 81-year-old Cree from Cowesses Reserve, recalled to anthropologist Koozma Tarrasof details of this "small, but powerful" man's curative methods: "[Sitting White Eagle] used to have a rattlesnake skin which he placed beside whoever he was doctoring, whether on the floor or on the ground in a tepee in summertime. Well, he'd ask this patient to lay down and he'd sing to his rattlesnake. This rattlesnake was just like it was alive; he had no head, only a tail. And he'd start crawling. If he'd crawl over this person that's being doctored, this meant the patient would get well."

In 1991 I was personally able to interview two men from the Crooked Lake Reserves who had known Sitting White Eagle. Louis Gunn, born in 1905, recalled: "He used to have a little shack, we used to call it Gaddie's Lake. He used to have a fireplace where [as in] the old time ways, [it was an] open [hearth]. I remember that old man, he was a powerful Indian." Jeremy Asaikin recounted: "He was about 80-85 when I first remembered this old man. . . he came at one time to doctor my mother . . . See my mother was pretty sick. . . he told my dad, 'lit this

pipe! . . . when I have smoked that pipe your wife will be better, she'll get up.' And that's what happened. . . an' my mother done well. I must have been about six year old . . . and I was there when he cured her. And as far as me, when I was seven years old I went to school and then I was stricken with tuberculosis. Again, my dad went for him. I never went to no Whiteman hospital. He told my dad what to do. And then, this is why I'm here today. I was stricken with heavy tuberculosis, very bad."

Like most medicine men, Sitting White Eagle charged dearly for his services, and collected his fee promptly. On different occasions, Inspector Graham visited the old man's tipi. "Sometimes it was surrounded by articles such as stoves, wagons, sleighs, harnesses, horses, and cattle that he had collected for his services," he reported. "They were always good collectors. On other occasions when I visited him he had practically nothing in the way of horses and cattle and effects. He had either sold them or given them away at a dance."

It is astounding to consider that these accounts of Sitting White Eagle come to us in the breath of only two lifetimes. Sitting White Eagle and his generation felt the brunt of the calamitous transition to life on the reserve. By placing their testimonials on record, these elders guide and strengthen future generations. As Plains Cree Edward Ahenakew (1885-1961) noted around 1930, "We most truly honour what is past, when we seek in our changed conditions to attain the same proficiency that our fathers showed in their day and in their lives." Inside the Museum we also "honour the past" by carefully gathering objects, information, and images scattered over time, and giving them coherence. By reassembling the scattered pieces of Sitting White Eagle's story, we now have a portrait of a remarkable man and the interesting times in which he lived. ■



# Non-Birds of

*Fossils showing the evolution from scaly non-flying dinosaurs to feathery flying forms offer us a rough sketch of how and why feathers evolved.*





# a Feather



**E**ARLY IN THE FALL OF 1996, a rumour circulated that the fossil of a non-avian or non-bird dinosaur with a covering of feathers was discovered in China. The fossil apparently represented a small meat-eating (theropod) dinosaur—closely related to the chicken-sized *Compsognathus* of Europe. The significance of the fossil could be far-reaching—if the dinosaur were feathered, then the theory of the dinosaurian identity of birds would be sealed, because feathers are unique to birds.

A month later, at the annual meeting of the Society of Vertebrate Paleontology, I was invited to look at photographs of the specimen. I was unprepared for the excellent quality of preservation of the fossil and the high resolution of the images. From the pictures alone it seemed clear that

the fringe around the dinosaur's body was consistent with the structure of feathers. This was no small shock—I had to sit down to adjust to the possibility for this fundamental change in my world-view: feathered dinosaurs!

In the following years, the main specimens of *Sinosauropteryx*—the dinosaur in the photos and the first feathered non-avian theropod debuted to the world—were scientifically described along with several new species of feathered theropods found since then.

In part, a misunderstanding of how animals are related to each other once hampered the study of the origin of birds. This early approach—traditional systematics—proposed relationships between animals without distinguishing between primitive features (which might be

**By Thomas D. Carr**





present in remotely related animals) and advanced features (exclusive to closely related animals). For a long time, it was uncertain whether or not the similarities between birds and dinosaurs were due to common ancestry or to convergent evolution (they just happened to evolve in similar ways).

The key concept to determining evolutionary relationships is lineage—a group of species that includes an ancestor and all of its descendants. “Dinosaurs” and “birds” are two examples of lineages. A unique feature of lineages is that small lineages are a part of larger groups. For example, birds are a small group within the big group of theropods, which in turn is within the bigger lineage of dinosaurs. What is the evidence for such evolutionary relationships? Birds and other dinosaurs share sim-

ilarities that exist in no other organism. Based on the fossil record it turns out that the features we use to differentiate birds from all other living animals—the wishbone, feathers, folding wing, three main walking toes, hollow bones—actually evolved in non-avian theropods (theropods that were not birds).

I use the term “bird” in this article to refer to feathered dinosaurs that have a pygostyle, the end-most segment of the tail composed of the last several vertebrae fused into a single unit. Therefore, feathered dinosaurs with tails composed of unfused vertebrae, including *Archaeopteryx*, are not birds. I prefer this approach because it allows my discussion to focus on the features that became progressively more similar to modern birds, all of which have a pygostyle.

## The Players

### COMPSOGNATHUS LONGIPES

**TRANSLATION** Long-footed delicate jaw

**AGE** 156 – 150 million years

**NUMBER OF SPECIMENS** Two

**BODY LENGTH** About 1.1 metres (3.6 feet)

**FEATHERS** None preserved

**PLACE IN THEROPOD EVOLUTION** One of the most primitive members of the group called Coelurosauria (“hollow lizards”), which includes the most bird-like theropods. *Compsognathus* is most closely related to the small Chinese theropod *Sinosauropteryx*.

### SINOSAUROPTERYX PRIMA

**TRANSLATION** First Chinese lizard wing

**AGE** 124.6 – 122.5 million years

**NUMBER OF SPECIMENS** Three

**BODY LENGTH** More than 1.25 metres (4 feet)

**FEATHERS** Plumulaceous (fluffy), with barbs and a rachis

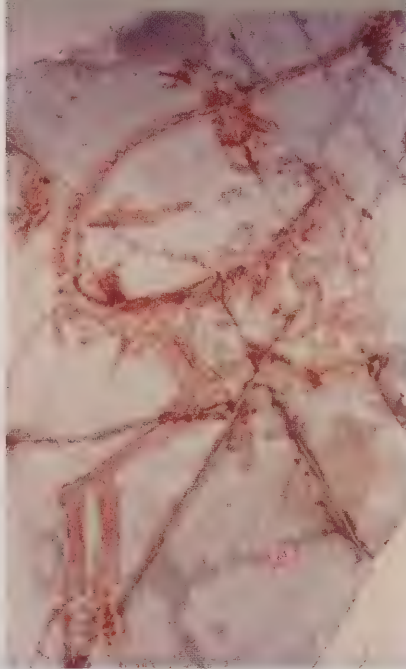
**PLACE IN THEROPOD EVOLUTION** One of the most primitive members of the group called Coelurosauria (“hollow lizards”), which includes the most bird-like theropods. *Sinosauropteryx* is most closely related to the small European theropod *Compsognathus*.

### CAUDIPTERYX ZOU

**TRANSLATION** Vice-premier Zou Jiahou's tail feather

**AGE:** 124.6 – 122.5 million years

The largest of the three specimens of *Sinosauropteryx prima*, in which feathers were limited to a short mid-limb, covers the body. Courtesy of Dr. T. E. Williamson



**NUMBER OF SPECIMENS** Two

**BODY LENGTH:** 89 centimetres (2.9 feet)

**FEATHERS:** Remiges (hand-feathers) and rectrices (tail feathers)

**PLACE IN THEROPOD EVOLUTION**

*Caudipteryx* was a type of oviraptorosaur, a lineage of partly to completely toothless theropods with short tails. Oviraptorosaurs are known from Asia and North America and they lived between 126 and 65 million years ago. This lineage is thought to be

The holotype specimen of *Caudipteryx zoui*, a complete articulated skeleton showing the non-aerodynamic primary feathers (of the hand) and rectrices (of the tail). Courtesy of Dr. T. E. Williamson



more closely related to birds than are *Sinosauropteryx* and *Compsognathus*.

### CAUDIPTERYX DONGI

**TRANSLATION** Dr. Zhiming Dong's tail feather

**AGE** 124.6 – 122.5 million years

**NUMBER OF SPECIMENS** One

**BODY LENGTH** Probably less than a metre (3.3 feet)

**FEATHERS** Primary remiges (hand feathers), contour feathers.

**PLACE IN THEROPOD EVOLUTION**

*Caudipteryx* was a type of oviraptorosaur, a lineage more closely related to birds than are *Sinosauropteryx* and *Compsognathus*.



Thanks to the excellent 110- to 133-million-year-old lake deposits in northeastern China, the fossil record of the change from scaly non-flying theropods to feathery flying forms is complete enough to provide a rough sketch of feather evolution and to answer a few questions along the way: Did theropods have true feathers? Did feathers evolve for flight? What is the place of *Archaeopteryx*—often claimed to be the first bird and considered central to the question of the origin of birds and flight—in the context of the new fossils?

## A scaly start

**Dinosaurs evolved from** a scaled ancestor. Mummies of scaly hadrosaurs (duck-billed dinosaurs) continue to be

collected from western North America, and patches of skin, or skin impressions, have been found associated with many types of dinosaurs, including armoured, horned, long-necked, and theropod dinosaurs. Dinosaur scales are generally bead-like, arranged in rosettes, and usually not overlapping. Scale size varies in individuals, and some lineages, such as Thyreophora (the armoured dinosaurs), evolved elaborate plates (stegosaurs) and studs (ankylosaurs) from their skin. Non-avian theropod scales were generally small and bead-like. In the recent common ancestor of the most bird-like theropods, the coelurosaurs, the genetic information for scales mutated to produce the first feathers.

The evolution of feathers is a component of the evolution

The holotype specimen of *Caudipteryx dongi* an articulated skeleton leading the skull, neck, and end of the tail. Photo by T. D. Carr.



Close-up of the arm of the holotype of *Caudipteryx dongi* showing the non-aerodynamic, brushy primary feathers of the hand. Photo by T. D. Carr.



One of the many specimens of *Confuciusornis sanctus* showing impressions of contour feathers (remiges [forewings], flight feathers), and the paired ornamental plumes of the tail. Photo by T. D. Carr.



### MICRORAPTOR GUI

**TRANSLATION** Dr. Gu Zhiwei's little raptor

**AGE** About 110 million years

**NUMBER OF SPECIMENS** Six

**BODY LENGTH** 77 centimetres (2.5 feet)

**FEATHERS** Plumulaceous (fluffy) and pennaceous (branched) (aerodynamic and non-aerodynamic) feathers

#### PLACE IN THEROPOD EVOLUTION

A primitive dromaeosaurid, the lineage of dinosaurs more closely related to modern

birds than to oviraptorosaurs.

### CONFUCIUSORNIS SANCTUS

**TRANSLATION** Sacred bird of Confucius

**AGE:** 124.6 – 122.5 million years

**NUMBER OF SPECIMENS** Hundreds

**BODY LENGTH** 20 centimetres (7.8 inches)

**FEATHERS** Plumulaceous (fluffy) and pennaceous (branched) (aerodynamic and non-aerodynamic) feathers

#### PLACE IN THEROPOD EVOLUTION

More closely related to modern birds than is *Archaeopteryx*.



of theropods. Today, scientists agree about the general sequence of meat-eaters, which I follow in this account, proceeding from the least bird-like theropods, to those that are most similar to birds, and then to birds themselves.

## The first feathers

**In living animals**, scales and feathers develop from thickenings in the skin. Ones that become feathers grow into a finger-like extension called a feather bud. A gutter then forms around the base of the bud resulting in a feather follicle. With the follicle present, the feather bud is called the feather collar and growth occurs within it. In its simplest form, a feather grows into a hollow cylinder by cell growth at the base of the feather collar. On the basis of this development, it is presumed that the first feathers were simple and hollow bristle-like structures. Scientists presume this because in a general way development replays the sequence of evolutionary changes. The pattern of feather growth can be used to assess the completeness of the fossil record of feathers.

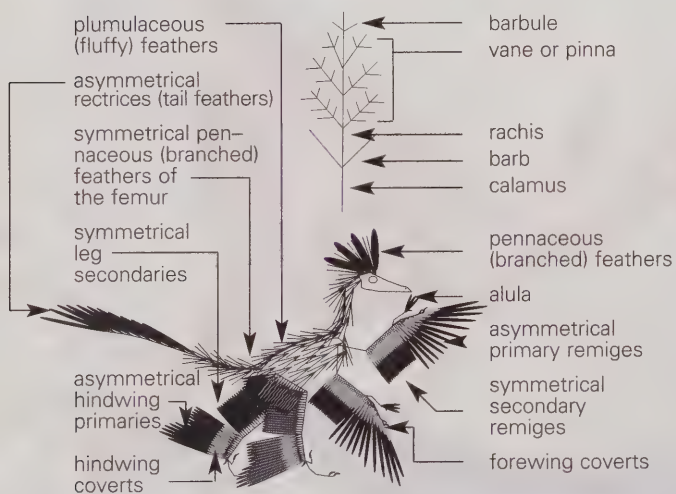
*Sinosauropteryx*, the dinosaur of the photos, is a feathered coelurosaur and so is more closely related to birds than are scaly theropods; most of its feathers look like individual bristles that extend back and away from the skeleton, but they are

thickly matted together, making it impossible to see any details close to the skeleton. In a few places it appears that the feathers were more complex than simple bristles, indicating that *Sinosauropteryx* feathers were not the first type of feather to have evolved. Only the fossils of more remotely related and feathered coelurosaurs will indicate if the first evolutionary appearance of feathers matches the first stage of growth of feathers. Fossils of this first stage have not been found because the known fossils do not match biologists' ideas of what the first feathers looked like. This indicates that there are undiscovered coelurosaurs more primitive than *Sinosauropteryx* with the initial bristle-like covering.

In the second main stage of feather growth, the inner layer of the feather collar forms barb ridges. The resulting feather is a tuft of barbs extending from a single quill.

Notably, *Sinosauropteryx* feathers match the third main step in feather growth. The inner layer of the collar forms barb ridges, which eventually form the main parts of the feather: the main stem and the main branches (barbs). The barb ridges grow toward the front of the follicle, where they meet and fuse to form the main stem, thereby producing the main branched structure of a feather. Eventually barb ridges stop forming and the feather resumes its cylindrical growth to produce the quill.

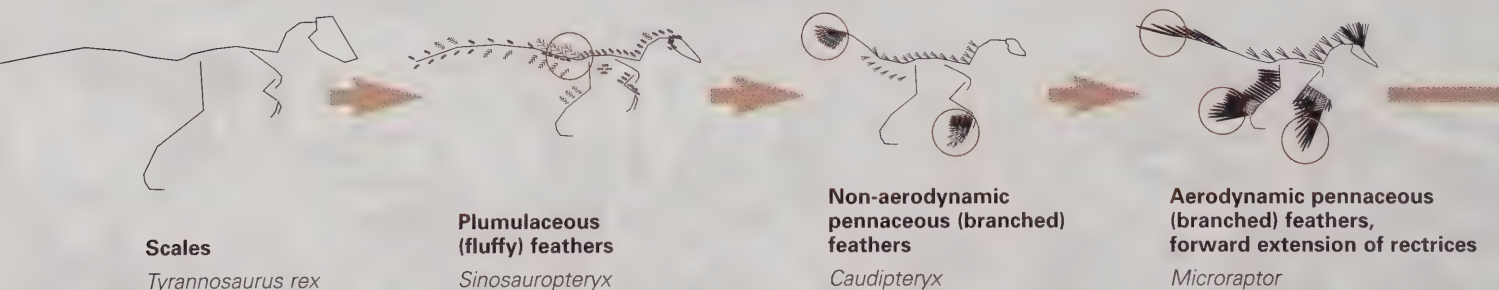
## ■ feather anatomy ■



## ■ growth, types, and distribution

feather type	—	↘	↘↘
characteristics	single unbranched keratin structure	plumulaceous; tuft of non-pinnate barbs; many unbranched keratin filaments	bipinnate; rachis indistinct; open vanes
<i>Sinosauropteryx prima</i>	—	↘	↘↘
<i>Caudipteryx</i>	—	↘	↘↘
<i>Sinornithosaurus</i>	—	↘	↘↘
<i>Microraptor</i>	—	↘	↘↘
<i>Archaeopteryx lithographica</i>	—	↘	↘↘
<i>Confuciusornis</i>	—	↘	↘↘
	growth stage 1	growth stage 2	growth stage 3

## ■ the seven main steps from scales to modern plumage ■





Finally, the branched feather breaks through the sheath that packages it before unfurling into its final shape.

The feather impressions of *Sinosauropteryx* show fine filaments that branch away from a common axis, indicating that the feathers were composed of a main stem and barbs. Because bird feathers have these branched characteristics the structures on *Sinosauropteryx* may be considered true feathers. So, the feathers of *Sinosauropteryx* match the third major step in feather growth: a main shaft with a fringe, or vane, of barbs extending from either side.

With the exception of the snout, hand, and foot, which were probably scaly, the entire body of *Sinosauropteryx* was covered in feathers. These early feathers were still quite simple: the barbs did not interlock, which probably gave the dinosaur a fluffy appearance. Probably these feathers offered *Sinosauropteryx* thermal insulation, heat shielding, water repellency, camouflage, and communication with members of its own species, like the blazing colours of the long tail feathers that male peacocks use to attract mates.

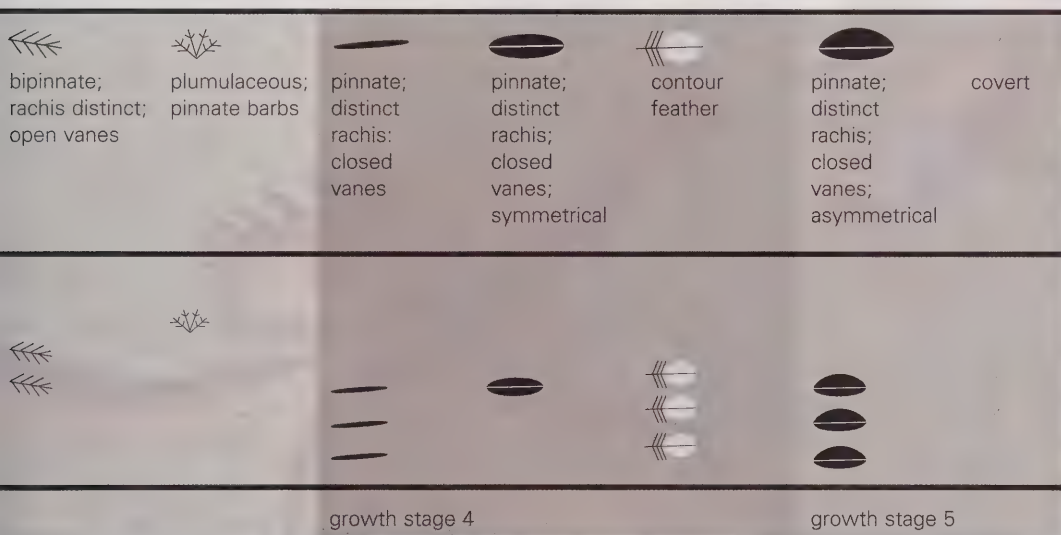
## The first feathers with planar vanes

During the summer of 2000 I had my first opportunity to examine the fossils of the feathered dinosaurs at the Insti-

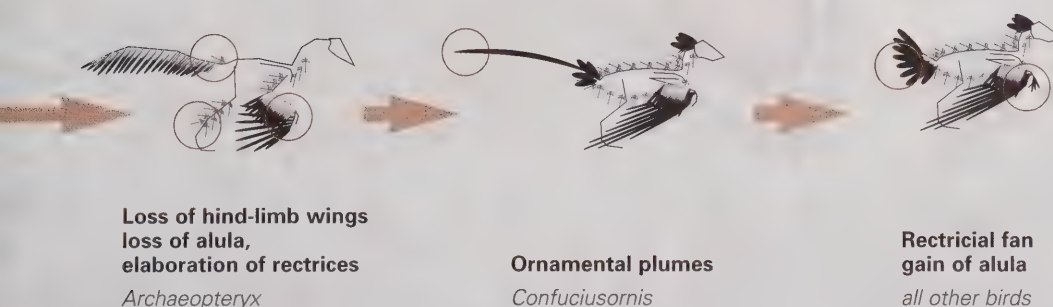
tute of Vertebrate Palaeontology and Palaeoanthropology in Beijing. Soft-tissue preservation—fossils of tissues other than bone—is rare in the fossil record. Until I went to Beijing I had studied tyrannosauroids, the giant (12 metre, 39.3 foot) theropods that lived during the Cretaceous (144–65 million years ago) in Eurasia and North America, for which only the occasional scaly skin impression is known.

The first feathered dinosaur I studied first-hand was *Caudipteryx*, a 90-cm- (2.9-foot) long non-avian theropod that belongs to a lineage called oviraptors or egg-stealers, which are more closely related to birds than is *Sinosauropteryx*. Accordingly, the feathers of *Caudipteryx* are more similar to those of modern birds. As well as a body covering of small down-like feathers, *Caudipteryx* had long-vaned feathers extending from its wrist and hand and from the end of its tail. *Caudipteryx* feathers match the same stage of feather growth as those of *Sinosauropteryx*, with minor exceptions.

The hand and wrist feathers of *Caudipteryx* extend from the hand along the second finger to the palm. In birds, these long feathers extending from the hand are called primaries, and those extending from the back of the forearm are called secondaries, a pattern that started with dinosaurs like



**Far left:** Parts of a feather, and the details of the flight feathers in a dromaeosaurid. So far, *Micro-raptor* is probably the most important feathered dinosaur discovery to come out of northeastern China. *Micro-raptor* is evidence that a modern plumage was nearly completely evolved by the Late Jurassic; dromaeosaurids were primitively small and were flying for at least 28 million years prior to the deposition of the 122 million-year-old Chinese lake deposits. **Left:** Different types of feathers, and their distribution among feathered dinosaurs and the early bird *Confuciusornis*.



The available data suggest that the evolution of feathers followed a stepwise progression from simple downy feathers to aerodynamic feathers with later flight-related refinements.



*Caudipteryx*. *Caudipteryx* has 14 primaries, more than modern birds—which at most have 12.

*Caudipteryx* had at least 11 pairs of tail feathers arranged along the last six vertebrae of its tail, a number consistent with modern birds, which have up to 16 pairs. The hand and tail feathers show evidence of banding, with alternating dark and light stripes. Melanin (a pigment that darkens skin, scales, and feathers), which is a dense and wear-resistant material, may have caused the dark stripes, but the original colour of the feathers has long since been lost.

Several features indicate that *Caudipteryx* was not a flier. Its arms and its hand feathers are too short to have provided enough surface area to support the animal in the air. Interlocking secondary branches extending from the barbs, called barbules, are necessary for the vanes of a feather to remain closed during flight, and the feathers of *Caudipteryx* do not have them. As well, the vanes indicate that the feathers could not twist into the appropriate shape during a wingbeat to maintain stable flight. Finally, the tail feathers are limited to the tip of the tail, providing insufficient surface area for lift or manoeuvrability.

Although *Caudipteryx* did not fly, it probably used its hand and tail feathers for display when interacting with other members of its species. The presence of banding in the tail feathers

fits this hypothesis. It would appear that communication rather than flight drove the intermediate stages of the evolution of long-vaned feathers. Regardless, the feathers of *Caudipteryx* provided the ideal beginnings for a flight apparatus.

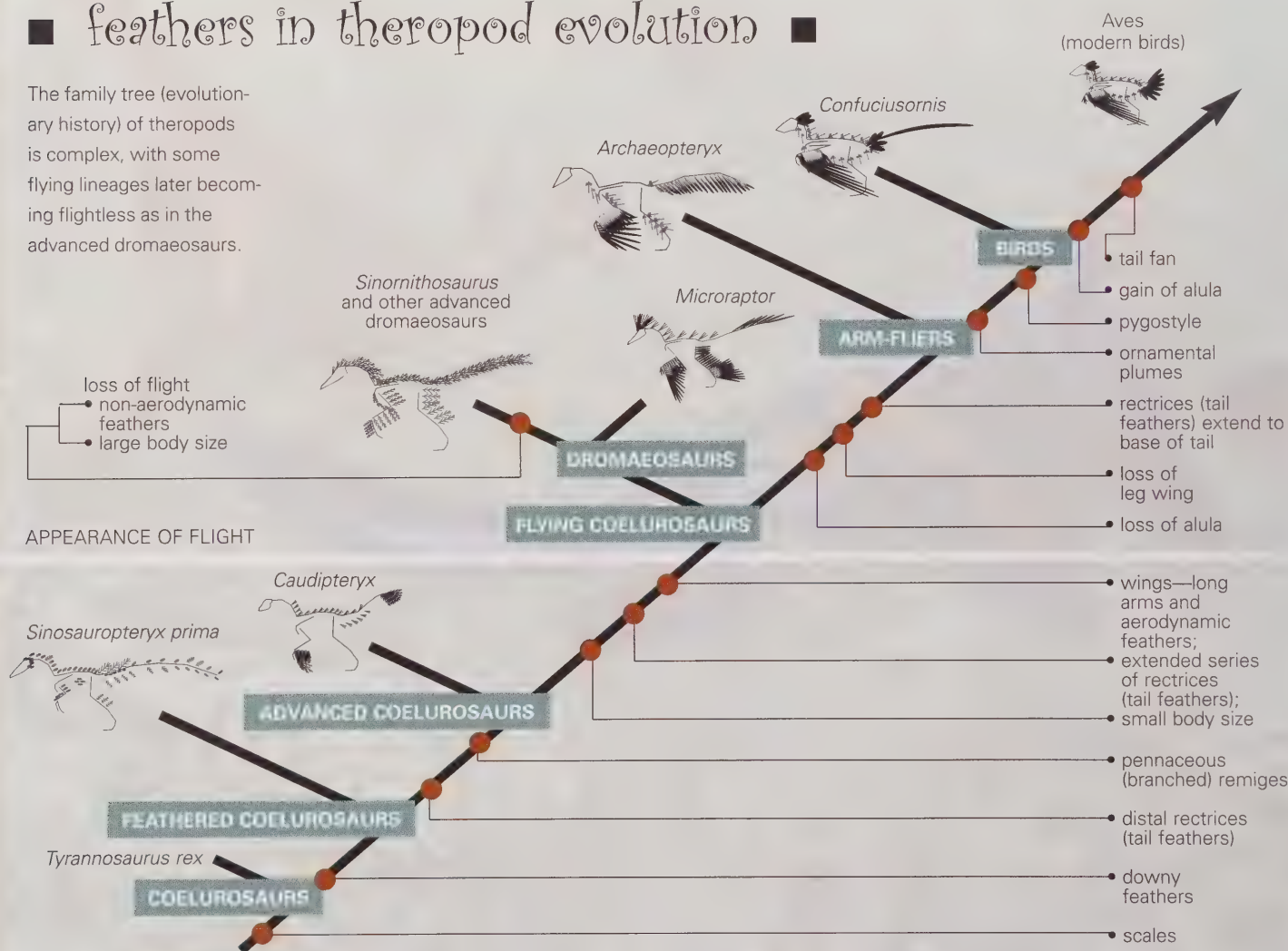
Feathered dinosaurs were a new experience for me; they were a rare instance of the fossil record offering up an answer to one of the most contentious issues in natural history—the origins of birds and flight. These important fossils are reminders that we are the apprentices of the fossil record and not its masters. The fossil record itself always has the last word. In the meantime, another bombshell was about to drop on evolutionary biologists' thinking.

## The start of modern plumage

The second shocker in the story of feathered dinosaurs, after the announcement of the feathery *Sinosauropteryx*, came in 2003 with a scientific report on a four-winged dinosaur from China that was actually able to fly. It turned out that flight was initially the domain of the most vicious theropods to evolve. Dromaeosaurids, or raptors, are considered among the closest relatives of birds among theropods. They ranged in size from less than half a metre (1.6 feet) to 6 metres (19.7 feet) in length. Their most distinctive features included long arms

## feathers in theropod evolution

The family tree (evolutionary history) of theropods is complex, with some flying lineages later becoming flightless as in the advanced dromaeosaurs.





tipped with hooked claws, a stiff coach-whip tail, and a "switch-blade" claw on the second toe. They were clearly agile predators and, although puny next to their 9- to 12-metre (30 to 40 foot-) long tyrannosauroid contemporaries, they would have been equals in ferocity if they had hunted in flocks.

Dromaeosaurid feathers are known best from the species called *Microraptor gui*, which had a nearly fully modern plumage. Its body was covered in contour feathers, which in modern birds contribute to the outline of the body. These feathers have closed vanes with a main stem and a downy base. Based on development, this type of feather is more advanced than those of *Caudipteryx* because a new feature, the barbules, extend from the barbs and close the vane by means of their interlocking hooks and grooves that zip the vanes into a single continuous surface. This system is what allows you to pull the vane of a feather apart and stroke it back into its original shape. Contour feathers covered *Microraptor* and were specialized for various functions on different parts of the dinosaur's body. Like a blue jay, *Microraptor* had long contour feathers on its head, which may have formed a crest that would have been used for signalling to others.

Like *Caudipteryx*, *Microraptor* possessed hand and tail feathers but *Microraptor*'s hand feathers were specialized into

a wing. A dinosaur wing is composed of several types of feathers. The main flight feathers include the following: the long primaries that extend from the hand; the secondaries that extend from the forearm; and the alula, a small set that extends from the thumb. The coverts are layers of feathers above and below the main flight feathers. All these feather types are present in *Microraptor*. Even the number of flight feathers in *Microraptor* is similar to modern birds. In addition to the modern complement of feathers, *Microraptor* had a leg wing that included primaries, secondaries, and coverts.

## First flight

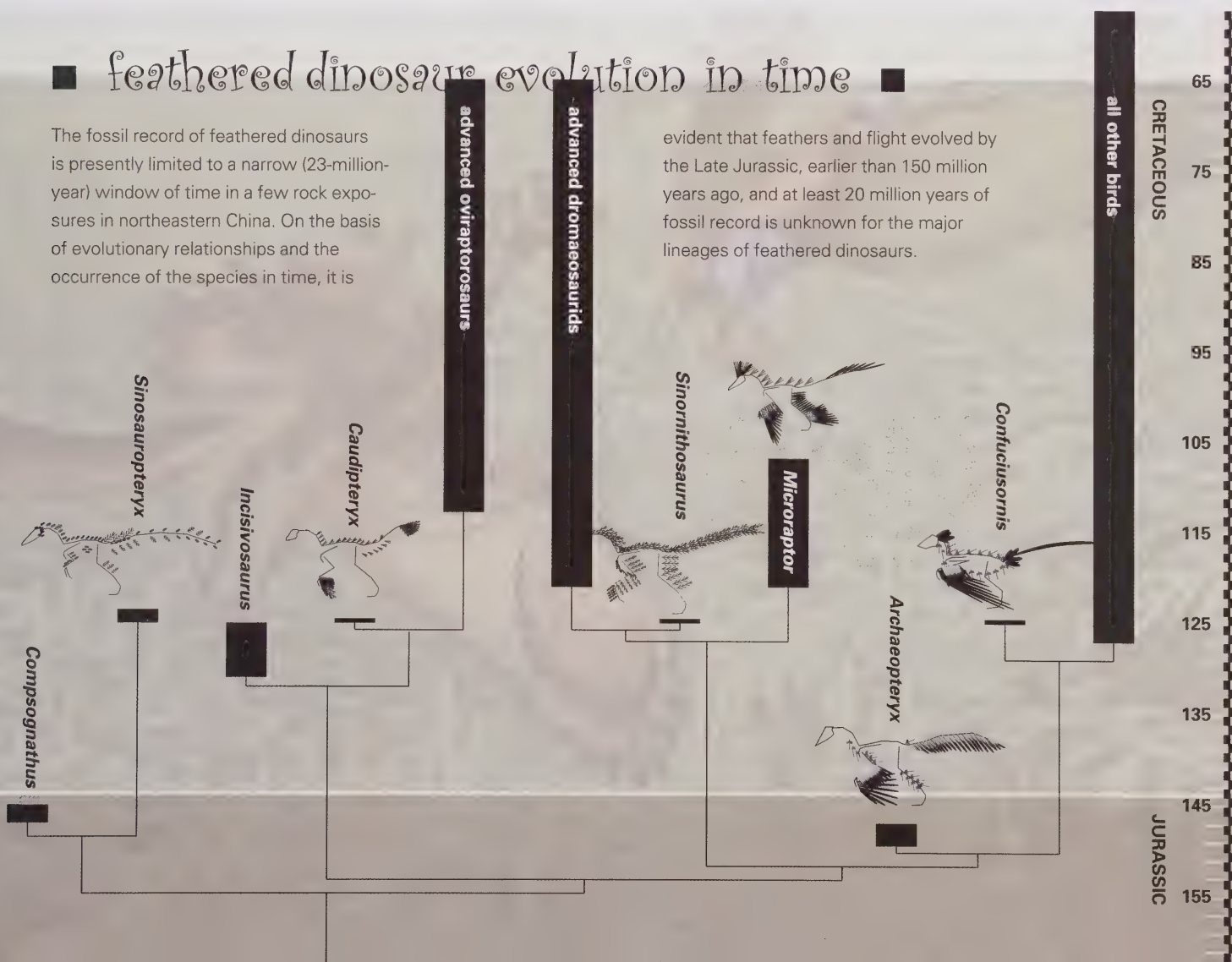
***Microraptor* feathers** are aerodynamic. They are long and have closed vanes with the outer vane narrower than the inner vane like feathers of modern birds. This asymmetry works in concert with the length-wise curvature, stiffness, and attachment to the hand, allowing each feather to automatically twist upwards and open the wing during an upstroke and twist downward to close the wing during the downstroke. The asymmetry ensures that the wing functions as an effective propeller during flight and allows the dinosaur to control the wing during aerial manoeuvres and at critical moments such as take-off and landing.



## feathered dinosaur evolution in time

The fossil record of feathered dinosaurs is presently limited to a narrow (23-million-year) window of time in a few rock exposures in northeastern China. On the basis of evolutionary relationships and the occurrence of the species in time, it is

evident that feathers and flight evolved by the Late Jurassic, earlier than 150 million years ago, and at least 20 million years of fossil record is unknown for the major lineages of feathered dinosaurs.





The gross aerodynamic shape of the vanes of *Microraptor*'s feathers indicates that they had barbules, which are necessary for flight. Interlocking barbules appear late in evolution, as they do in feather growth.

The arm and hand feathers of *Microraptor* are almost three times as long as the upper arm bone. Not only is a long wing necessary to provide enough surface area to allow the dinosaur to be lifted into the air, but the secondary feathers provide more surface area by extending the wing surface all the way to the body. In contrast, the absence of secondary feathers in *Caudipteryx* is consistent with the non-aerodynamic structure of its primary feathers.

*Microraptor* has another flight feature: several short feathers extend from the thumb, forming the alula, or "bastard wing," which is important for creating lift when a dinosaur slows down for a landing. Additional lift prevents the animal from stalling (dropping out of the air) when flight speed slows down.

Unlike the limited tail plume of *Caudipteryx*, *Microraptor* tail feathers are more extensive, reaching at least to the mid-point of the tail. During flight, they would have been important for maintaining a stable flight path, for lift, and for acting as a rudder or as a brake during landing.

Most astonishing of all are the leg wings, with 14 long-vaned feathers extending from the sole and a series of shorter pennaceous feathers extending from the lower leg, an organization similar to that of the arm wing. Unlike humans, theropods walk on their toes, so the sole feathers would not

have interfered with walking or perching. These feathers also have the form of asymmetrical primary feathers, underlain by a series of coverts. The primaries are long, up to twice the length of the thighbone. This feather arrangement suggests that the leg wing functioned like the arm wing—it had its own flapping cycle. The function of the leg wing, however, has yet to be scientifically studied. Unlike the arm, the leg wing appears to lack a set of thumb feathers.

*Microraptor* is significant for several reasons. First, it indicates that flight did not first evolve in birds, that the evolution of flight may have started with four wings, and that the basic complement of flight feathers—with primaries, secondaries, coverts, thumb feathers, and aerodynamic tail feathers—evolved early and has since undergone little change.

## Archaeopteryx

Although *Archaeopteryx* is the most famous fossil "bird," it is neither the first bird nor the ancestor of modern birds. It simply represents another step along the continuum from non-flying scaly dinosaurs to modern flying birds. Its significance is that it shows the next refinements in the flight apparatus: tail feathers that nearly reached the base of the tail, the first primary feather reduced to the tiny remicle, and the loss of the leg wing.

Although *Archaeopteryx* has pennaceous or branched feathers on the leg, they are much shorter than those of *Microraptor* and so probably did not form a wing. While some have argued recently that *Archaeopteryx* may have had a leg wing, those ob-

# Loss of Flight Among Feathered Dinosaurs

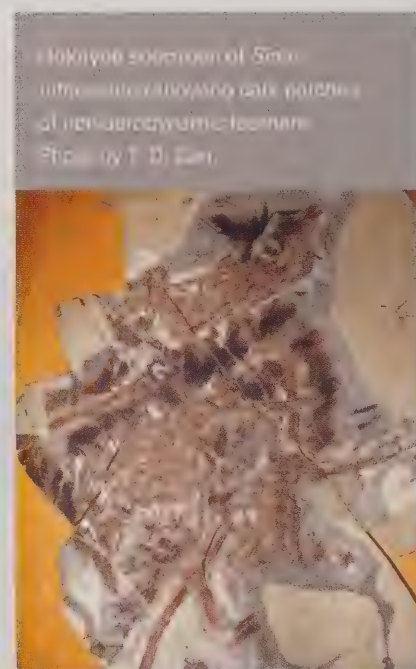
*Sinornithosaurus*, *Deinonychus*, and *Velociraptor* are a few of the dromaeosaurids that are more advanced than *Microraptor*. They are a strange crowd: unlike *Microraptor*, they are large, up to six metres (19.7 feet) long, and lack aerodynamic feathers but possess features typical of flying theropods, such as a large bony breastbone (sternum), a folding wrist, bony struts extending from the ribs to the sternum (sternal ribs), bony struts between adjacent ribs (uncinate processes), and a stiff tail. How do we explain the presence of flight-related features in animals that evidently did not fly?

We have to remind ourselves that evolution is conservative. Once evolved, features are usually kept whether they remain functionally important or not. The vestiges of the primitive mammal claw, for example, is kept in humans and other apes as flat

nails. Likewise, the presence of flight-related features in advanced dromaeosaurids is an example of retained features, evidence they lost flight.

This hypothesis is consistent with the evolutionary relationships suggesting that flight evolved once in an ancestor and was later lost in advanced dromaeosaurids. Still, the underlying skeletal equipment didn't change significantly.

Flightlessness has occurred numerous times in bird evolution, as seen in unrelated lineages of modern flightless birds, such as penguins, some species of doves and rails, and ratites (ostriches, emus, kiwis, and kin). Notably, *Archaeopteryx*, early birds, and early dromaeosaurids, such as *Microraptor* are small because scientists expect that small size was crucial for the initial evolution of flight in dinosaurs.





servations have not been published scientifically.

Strangely, *Archaeopteryx* appears to have lost the thumb feathers, as did some later birds. This curious phenomenon suggests that species without thumb feathers were able to cope with stalling or could prevent a stall using another structure or action. Regardless, the thumb feather structure does not appear to have been lost along the line of evolution leading to modern birds.

## Toward the modern feather array

**The biggest difference** in plumage between modern birds and *Archaeopteryx* is the short tail fan of the former, unlike the long frond-like tail of the latter. But the evolution of the tail fan did not occur in one step.

*Confuciusornis* is a common fossil found in the same quarries as the feathered dinosaurs and it is more closely related to modern birds than is *Archaeopteryx*. Like *Archaeopteryx*, *Confuciusornis* did not have thumb feathers, a feature that reappears in later birds. The tail skeleton of *Confuciusornis* is similar to that of modern birds—it has eight or nine vertebrae fused together into a single unit structure called a pygostyle.

Very short and thin feathers extend from around the pygostyle in *Confuciusornis*, whereas *Archaeopteryx* and modern birds had long tail feathers. In fact, the *Confuciusornis* tail essentially lacks long feathers. When long tail feathers are present, they are a pair of long narrow plumes that could only have served for display, not flight. Unfortunately, fossils of birds with tail fans have not been found. The first appearance of the

tail fan is one of the few feather mysteries yet to be solved.

*Confuciusornis* was the earliest bird to evolve a ribbon-like feather with barbs that are not differentiated from the main stem except in the last quarter of the plume. Thus, a pair of streamers of continuous sheets of keratin extended from its tail, similar to the blobs on the wings of modern waxwings.

After viewing the feathered dinosaurs and early birds from China, it was much easier for me to visualize birds as modern dinosaurs. From 1859 up to the mid-1980s, the origin of birds and flight was one of the most opaque mysteries in natural history. Within the space of a decade, fossils from one locality in China sealed the case that birds are dinosaurs and sketched out the main events of that history. It still seems unbelievable to my mind that the transition from non-avian dinosaurs to birds is one of the most complete transitions known from the fossil record because of the improbability of finding fossils of soft tissues such as feathers. From this point in history all that remains to be filled in are some details.

## The current state of affairs

**Evidence for** the dinosaurian identity of birds is conclusive—and no more controversial than the theory that humans are a species of African ape. While the feather doesn't make the bird, it was the key feature that allowed theropods to fly—and eventually to evolve into the most diverse lineage (about 9700 species) of land-dwelling vertebrates alive today. We mammals lived under the shadow of the dinosaurs for 170 million years during the Mesozoic, and 65 million years later, we still do. ■

## Did *T. Rex* Have Feathers?

**Shortly after** the confirmation of feathers in dinosaurs, scientists speculated in the popular press on the presence of feathers in *Tyrannosaurus rex*. The argument was mainly based on the evolutionary relationship of tyrannosaurs to other theropods: if *T. rex* belonged to the lineage of feathered dinosaurs then the hatchlings might have been feathered and those feathers would later be lost in scaly adults.

Unfortunately, the integument or body covering of *T. rex* and other tyrannosaurs has not been published scientifically, although scaly skin impressions have purportedly been found. To my eye, the scales are typical of other dinosaurs: small, non-overlapping, and bead-like. If the structures are scales, however, then the feathered-hatchling speculation loses support. This and another issue open up problems with the

feathered tyrannosaur speculation.

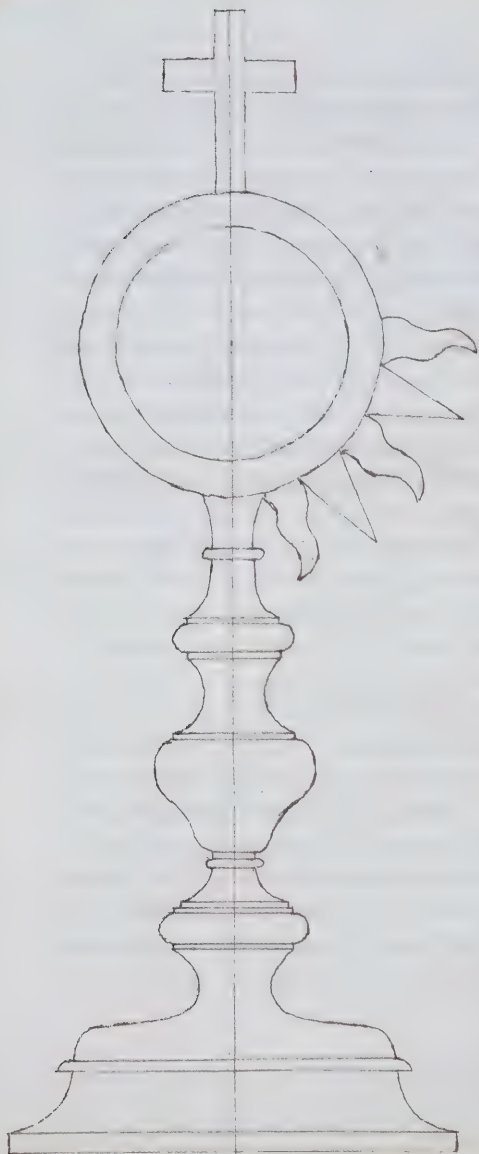
Follicles are genetically programmed to produce feathers in modern birds. The follicles form very early in development—within the first 12 days of growth in the egg. Although follicles produce different types of feathers during a bird's lifetime, the follicles never change to produce scales. Assuming this pattern is true for all birds and all feathered dinosaurs, then there is no precedent for a wholesale switch from feathers to scales. Thus, there is no rationale to suggest a switch in the first place.

As well, the evolutionary position of tyrannosaurs is in dispute. Some analyses place tyrannosaurs inside the feathered dinosaur lineage but others place them outside of that group. If tyrannosaurs do belong to the feathered lineage and if they had scales, then there was an evolutionary reprogramming of feath-

ers to scales, which seems improbable. If tyrannosaurs do not belong to the feathered lineage, then they were (of course) scaled. Either way, the purported presence of scales in tyrannosaurs indicates they never changed their outer covering during their lifetime.

Recently, however, a primitive tyrannosaur—*Dilong paradoxus*—was discovered from the same deposits as the feathered dinosaurs (from 139 to 128 million-year-old rocks). Four specimens have been identified, including an incomplete skeleton, which has simple branching (rachis and barbs, no barbules) feathers associated with it. Is *Dilong* a tyrannosaur? I have not yet studied these specimens, but the feathered individual makes me skeptical that the specimen is a tyrannosaur for the reasons given above; regardless, I am willing to be convinced otherwise.



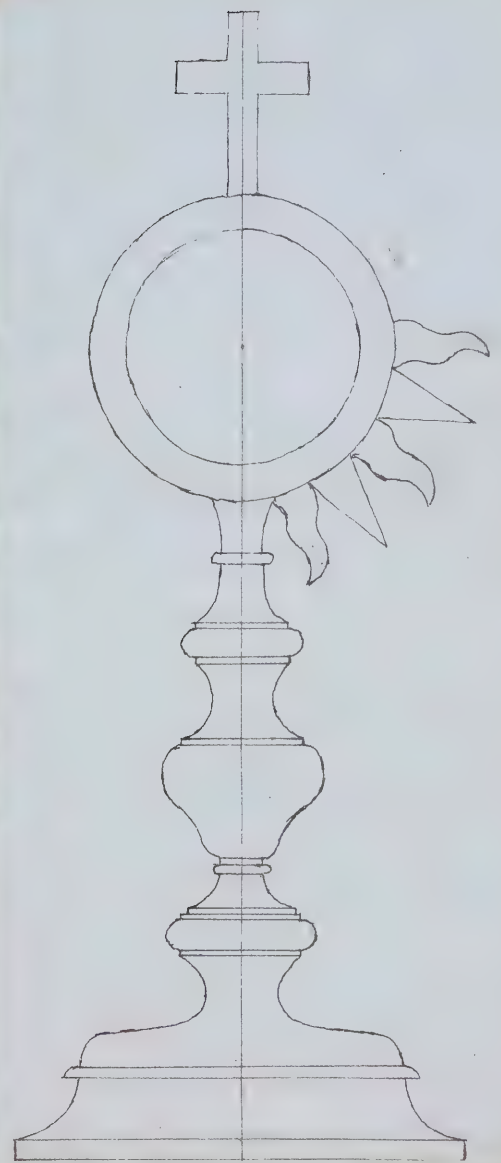


# Silver Standard

WHEN HE RETURNED to his native Quebec City in the spring of 1787, following a five-year training sojourn in France, Laurent Amiot seemed destined for an illustrious career as a silversmith. He was received enthusiastically by francophone Roman Catholic ecclesiastics, who were the main source of patronage for colonial silversmiths. No doubt his appeal resided in his superior training and his

knowledge of current French fashion in the liturgical arts. He was the only Canadian-born colonial silversmith—under either French or British rule—to benefit from training in Paris, which was the premier silversmithing centre in Europe. As a rule, up until this time colonial apprentices trained under immigrant silversmiths, most of whom were not themselves master silversmiths (i.e. certified guild





## By Ross Fox

*Peerless as a masterful silversmith,  
Laurent Amiot set the standard for exceptional  
silversmithing in colonial Canada.*



members) in their homeland; as a consequence, colonial training was often inferior.

Amiot's training, which he took pride in trumpeting, gave him a solid advantage over his colonial competitors. He considered himself not a mere craftsman, but an artist. In legal documents from his later career he styles himself "maître ès art d'orfèvrerie," or master in the art of silversmithing, in-

stead of the usual designation of "maître orfèvre," or master silversmith. And the title was well deserved.

Amiot's prominent standing in the silver scene lasted for more than 50 years, up until his death in 1839. His contemporaries Salomon Marion and Robert Cruickshank excelled in technique, and Marion and François Ranvoyzé in originality of design, but Amiot equalled, if not surpassed, all of

BRIAN BOYLE, ROM





BRIAN BOYLE, ROM / 954.98.1.2



MUSÉE NATIONAL DES BEAUX-ARTS DU QUÉBEC / 69.193 PHOTO BY JEAN GUY KEROUAC

them in both areas. He was also the most prolific.

Despite Amiot's eminent stature in the history of Canadian silver, only a single article has been written about him, a three-page, groundbreaking entry by René Villeneuve in the *Dictionary of Canadian Biography* (Vol. VII, pp. 16–18) in 1988. It was followed by the exhibition *Chez Laurent Amiot*, organized by Robert Derome for the Musée d'art de Saint-Laurent (now the Musée des maîtres et artisans du Québec), which circulated to a number of Montreal-area venues in 1998 and 1999. But it was not accompanied by a publication.

My own account of Amiot's work stems from my research for the new Sigmund Samuel Gallery of Canada: Historical and Decorative Arts—a Renaissance ROM gallery planned for the ROM's building expansion—which will feature both liturgical and domestic silver by Amiot. Among the ROM's Amiot holdings are four exemplary large works, a variety of flatware, and most intriguingly, an extremely rare group of 23 sheets of designs for liturgical silver associated with the Amiot workshop.

It is apparent from these works that early in his career Amiot championed a new direction in Canadian liturgical silver. While his domestic silver tended to be conventionally English in character (see "English Types Dominate Amiot's Domestic Silver," page 36), his liturgical silver was inherently French—just as Canadian silver in this category had been from the beginning—but with a difference. Amiot was the first Canadian silversmith to break with old Louis XIV models and to look to the more recent Louis XVI style. He also incorporated occasional English details—in the form of particular motifs—into his liturgical silver. In this way, he synthesized French and English elements to create his own personal version of classicism. This stylistic dichotomy and coalescence reflected the prevailing duality of Quebec City's cultural climate in the late 1700s and early 1800s.

Born in 1764, Laurent Amiot was the son of Jean Amiot, an innkeeper in Quebec City. Some scholars have speculated that Amiot's older brother, Jean-Nicolas, who was also a silversmith, introduced young Laurent to the trade. In 1782, Amiot's parents sent him to Paris, where he spent the next five years as an apprentice to an unidentified silversmith. Upon his return, Amiot set up his workshop in Quebec City and quickly cultivated a core clientele living in the lower valley of the St. Lawrence. Within a few years, this clientele extended upriver as far as Montreal Island.

Despite the high demand for his silver, Amiot operated a small workshop in the traditional manner, with only a few assistants. He staunchly resisted the encroachment of mechanization, upholding traditional silversmithing practices until the end. From the 1820s on, mass-produced imported French liturgical silver grew considerably in volume, becoming serious competition for Canadian silversmiths. Much of this silver had machine-stamped components of thin-gauged silver. Though often highly decorated, these pieces frequently lacked definition in the details and were insubstantial in weight. Destined mainly

**Top:** Holy water stoup, undated. Royal Ontario Museum.

**Bottom:** Holy water stoup for the Church of Notre-Dame-de-Liesse, Rivière-Ouelle, 1812. Laurent Amiot. Silver, 21 x 21 dia cm (8.2 x 8.2 inches). On deposit at the Musée national des beaux-arts du Québec. Purchase.



for the lower-end market, their chief advantage was the lower cost. In contrast, Amiot's silver always had a highly finished quality and a virtuoso, if measured, ornamental content. Amiot always used thick-gauged silver; his pieces weighed more than the French imports simply because of the greater silver content.

While Amiot made a fair quantity of table silver, his popularity with the church explains the prodigious quantities of liturgical silver that survive with his maker's mark. His range of liturgical articles—from monstrances and reliquaries to crucifixes and candlesticks—was unmatched by any silversmith in Lower Canada (Quebec).

Amiot's drawings for liturgical silver likely served as a kind of repertoire of designs used as a marketing tool for potential clients. Eighteen of his drawings in the ROM's collection are of chalices and five of ciboria, these being the most common liturgical vessels. Chalices contained the wine consecrated during Mass, ciboria the unleavened sacred bread known as the Blessed Sacrament. For Roman Catholics, the bread and wine are the body and blood of Jesus Christ.

Based on paper watermarks, most of the drawings—34 images on 23 sheets—can be dated to the second half of Amiot's career. Some of the remaining drawings may date later and are possibly by one or more of his successors. Since the Amiot workshop had almost a 115-year history—from Amiot through François Sasseville (1797–1864), Pierre Lespérance (1819–1882), and Ambroise Lafrance (1847–1905)—authorship and dates can be difficult to determine in cases where watermarks are absent. Along with tools and equipment, designs were passed from silversmith to silversmith, with the same designs or versions thereof being reused over long periods of time. This is symptomatic of a strong conservative aesthetic sensibility among many of the clergy—and the liturgical arts in general.

Amiot himself was sometimes restrained by this reluctance to yield to change. His drawing of a chalice shown on page 39 (top left) repeats a stock design belonging to Louis XIV classicism of the early 1700s. A more immediate design source was the Parisian silversmith Guillaume Loir (c. 1694–after 1769), in particular a chalice in Notre-Dame Basilica, Montreal, dating from 1749/50. Amiot repeated versions of this design. Other colonial silversmiths, including Robert Cruickshank and François Ranvoyzé, made similar chalices during the late 18th and early 19th centuries.

This design retrogression was a consequence of the curtailment of silver imports from France after the British Conquest. With the changed political climate in France from 1789, when Louis XVI was deposed, imports ceased altogether. Cut off from sources in France, Canadian silversmiths were compelled to look to old French silver, such as Loir's works, in local churches for their models. Though there was frequent copying, much colonial silver, rather than being mere servile imitation, shared a decorative vocabulary and an aesthetic approach with Loir. François Ranvoyzé even developed a very personal style, but that is another story.



BRIAN BOYLE, ROM / 937 57

**Opening spread (main image):** Detail of monstrance shown on this page. The mark "L.A." in a rectangle is a punch mark, or maker's mark, used by Amiot from c. 1790 to c. 1805, and possibly for a few years longer. This example is on the ROM monstrance. **Side images:** Drawing of a monstrance, c. 1827. Royal Ontario Museum, Gift of the Yale University Art Gallery (948.279.6.1). The Amiot drawings were a gift to the ROM from the Yale University Art Gallery. Ownership was transferred to the ROM in 1947 through the intermediary of American silver authority John Marshall Phillips, then acting director of the Yale gallery. The drawings were purchased by English silver authority E. Alfred Jones while on a visit to Quebec City at the turn of the 20th century. He later sold them to Francis Patrick Garvan, who in turn donated them to Yale. Eleven of the sheets have watermarks dating between 1822 and 1830. Two others have watermarks for 1801 and 1812. **This page:** Monstrance, c. 1795–1805. Royal Ontario Museum.



# English Types Dominate Amiot's Domestic Silver

Most of Quebec City silversmith Laurent Amiot's domestic silver, unlike his liturgical work, followed English models. Here, the Louis XVI style has no place. His domestic work, anchored in English neoclassicism, conformed to the fashion of the period. English taste dominated household and presentation silver in Quebec from the late 18th century on.

Teapots were the most common hollow-ware form for the table, and Amiot's tea silver was invariably inspired by English designs, whether neoclassic or Regency. A fine example of an Amiot neoclassical-style teapot is in the Montreal Museum of Fine Arts. Its oval body is utterly chaste, except for a delicately engraved medalion encircling a cipher on the side.

Quebec City sculptor and painter François Baillairgé kept a journal in which he recorded that he supplied Amiot with wooden knobs and handles for teapots—seven teapot handles are listed for the decade of the 1790s. Most of Amiot's teapot handles were wooden, but occasionally they were made of silver. So the figure in the journal is only a starting point when calculating how many teapots Amiot might have made in this period. It is also possible that Amiot obtained handles from other craftsmen, but other records indicate that he had a particularly close relationship with Baillairgé.

A coffee pot in the National Gallery of Canada represents Amiot at his finest. But does it synthesize French and English styles as is sometimes claimed? The classical urn shape of the body and the ornamentation are sometimes said to belong to the Louis XVI style. The scrolled mahogany handle and the curved spout ornamented

with acanthus leaves are said to be holdovers from the English rococo. This analysis is only partially correct—in the English rococo content. In its overall form, it is a typical English neoclassical coffee pot.

A very similar piece, illustrated in *The Collector's Dictionary of the Silver and Gold of Great Britain and North America* by Michael Clayton (New York, 1971, fig. XV!a) dates to 1771. Stylistically, it is a transitional piece incorporating old English rococo elements into a predominantly new neoclassical design. Even details such as the mid-band with garlands and the bud finial have English precedents. Amiot's model was therefore an English coffee pot dating from the 1770s, with Amiot's pot itself probably dating from the 1790s, that is, almost 20 years later.

From May through December 1796, Baillairgé's journal lists entries that may apply to Amiot's coffee pot. The first records a delivery to Amiot of "models," used as parts to be cast, for a silver pot: a spout, two handle sockets, and a finial for the cover. The last, in December, indicates that Baillairgé received payment of 3 shillings and 6 pence from Amiot for the handle of a coffee pot.

Among the largest and most impressive forms of table silver made by colonial silversmiths was the soup or stew tureen. Only three examples are known today. Two are by Amiot, and one of those is at the ROM. The Amiot tureens are similar in their swelling body and claw-and-ball feet, which reflect English rococo prototypes of the mid-18th century. The form is echoed in tureens by famed Huguenot silversmith Paul de Lamerie of London. Amiot's differ, however, in their more up-to-date laurel swags, which decorate their sides. It is the same motif that is seen in his liturgical silver. In effect, his two

An alternative chalice design by Amiot, shown on page 39 (top right), retains the same overall form and division of elements as the first piece, but is otherwise completely devoid of decoration. Pristine surfaces accentuate the equilibrium of proportions and impart a timeless quality suggestive of neoclassicism. The absence of decoration also meant no time-consuming chasing (working the surface) and, therefore, fabrication was easier and less expensive. The lower price would have been an attractive consideration for some of Amiot's clients. Chalices of similar design were made in France in the period immediately before the Revolution.

The bulk of Amiot's liturgical silver, however, followed more current design formulae. This new style is exemplified in a luxuriant chalice he made for the Church of Saint-Martin, Chomedey. In the motifs and overall richness of effect, this chalice exemplifies a more up-to-date classicism that is allied to the Louis XVI style of Amiot's Paris experience. The openwork calyx encasing the cup has four medalions with symbols of Christ's Passion and the Holy Eucharist, and includes an intervening repeat motif of clustered grapes, leaves, and wheat stalks.

The overall form of the chalice also betokens Louis XVI models in a certain hardness of outline, a clarity of defini-

tion, and a more vase-shaped knop or knob rather than the ovoid form of earlier chalices. But in more purely Louis XVI examples, selected surface areas are often organized in panel-like reserves, which accentuate an element of geometricity in the overall design. In Amiot's chalice, this element is more discrete.

There is also a hint of English influence in this same piece. If there is a single decorative motif that is ubiquitous in all national versions of neoclassicism, it is the swag, or festoon. But Amiot's rendering of this motif contains intimations of characteristic English solidity rather than French delicacy. Its inclusion amounts to a subtle and very personal accommodation of styles—an overt French neoclassicism coupled with a dash of English neoclassicism.

In 1812, Amiot made a comparable chalice for the Church of Saint-Cuthbert, which is now in the National Gallery of Canada. The ROM's Amiot drawings reproduce designs for three chalices of similar, though less elaborate, character. The design illustrated on page 39 (bottom right) is actually repeated in three different drawings. One of these bears a watermark for 1801, indicating that Amiot was working with this more advanced type of design relatively early in his career.



tureens are a stylistic hybrid—of rococo and neoclassical—that is unmistakably Amiot. In the Baillairgé journal, an entry for 1795 lists two wooden tureen handles that were made for Amiot. These were likely for the ROM tureen. The other tureen has silver handles.

Another splendid piece by Amiot is a standing cup with cover called the Taylor Cup, now in the National Gallery of Canada. The cup proper is an inverted bell, or campana, shape with lobed lower portion. The essential shape harks back to ancient Greek kraters and its considerable appeal in this period attests to an enduring indebtedness of the decorative arts to classical antiquity, even in a colonial context. In Canada, display articles of this kind were normally ordered from England, where they were in great favour.

This cup was commissioned by none other than George Ramsay, 9th Earl of Dalhousie, Governor General and Commander of the Forces in British North America. Dalhousie bestowed the cup upon George Taylor on the occasion of the launching of the brig *H.M.S. Kingfisher* at Taylor's dockyard in Lower Town, Quebec City, on May 14, 1827. His purpose was to promote the shipbuilding industry in Canada. This rationale, coupled with the fact that Dalhousie turned to a colonial silversmith for the cup itself, reflect his zeal in encouraging colonial crafts and industries.

The stylistic dichotomy between Amiot's French-inspired liturgical silver and his English-inspired domestic silver epitomizes much about the social, religious, and political conditions in Quebec at the time: French Roman Catholicism was the dominant religion, whereas the political and secular system was controlled by the English.

An enlarged version of the anglicized laurel swag seen on the chalice also occurs on some other liturgical articles by Amiot; otherwise they remain thoroughly French in character. This swag appears on the shoulders of censers (incense burners with a perforated cover and chains for hanging and swinging), holy water stoups (buckets), and sanctuary lamps. It is on a holy water stoup, for example, that Amiot made for the Church of Notre-Dame-de-Liesse, Rivière-Ouelle, dating to 1812. The affinity of this swag with the English neoclassical vocabulary is apparent in its prominent size and ponderous character. However, English silversmiths usually cast and applied, or embossed (hammered from inside), their swags, which project boldly in relief. Amiot's swags are flat-chased and barely project from the surface. It is Amiot's personal interpretation of the English swag. François Ranvoyzé and Pierre Huguet adopted a similar motif, probably in emulation of Amiot, but each interpreted it in his own way.

Lobing is another English motif Amiot borrowed from domestic silver. Found on some of his ciboria, it consists of convex, vertical ribs, which enclose the lower part of the bowl, forming a separable, calyx-like casing. It is a novel treatment unique to Amiot. Popular during the Regency period in England, lobing is found elsewhere on the Canadian

BRIAN BOYLE, ROM / 992.219.1.1-2

THE MONTREAL MUSEUM OF FINE ARTS, DENIS FARLEY / 1952.DS.41

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**Clockwise from top:** Tureen, c. 1795. Royal Ontario Museum; Cup Presented to George Taylor, 1827. National Gallery of Canada, Ottawa. Purchased in 2000 with a grant from the Government of Canada provided under the *Cultural Property Export and Import Act*. The unicorn's-head finial on the cover of the Taylor Cup has a double reference—to the crest of Lord Dalhousie and to the figure-head on the prow of the brig *H. M. S. Kingfisher*; Coffee pot from the LeMoine family, c. 1796. Laurent Amiot. Silver and mahogany. National Gallery of Canada, Ottawa. Gift of Suzy M. Simard, Westmount, Quebec, 1994, in memory of Dr. and Mme Guy Hamel; Teapot, c. 1800–10. Laurent Amiot. 15.1 x 28.4 x 12.1 cm (5.9 x 11 x 4.7 inches). The Montreal Museum of Fine Arts, Ramsay Traquair Bequest.





© 1989 THE DETROIT INSTITUTE OF ARTS / 69.297

scene in some domestic silver of the 1820s and 1830s, as on the Taylor Cup, seen on page 37.

In a few instances, as with baptismal ewers, Amiot converted actual English domestic forms, such as pap boats and miniature teapots, to liturgical use. Otherwise, the English ingredient in his liturgical work tends to be in the form of incidental motifs. These English flourishes aside, his lexicon of decorative motifs has a decidedly French bias. This is evident in a holy water stoup at the ROM, which is a stock type reproduced by Amiot on many occasions. The frieze encircling the shoulder is a kind of strapwork with alternating long and short tongue-like projections ending in a double-outlined fringe. Similar strapwork is found on his censers. In form, ornamentation, and overall conception, this stoup is thoroughly Louis XVI.

Monstrances are another example of Amiot's adherence to French models. Still, that does not keep him from distinguishing them with his personal style. A monstrance is a receptacle for the exposition of a large, consecrated wafer in a ceremony called the Adoration of the Blessed Sacrament. During this ceremony, the monstrance was elevated in a niche above the tabernacle on the altar, so as to be visible to all in the church. Monstrances were among the most grandiose articles of church silver produced by Canadian silversmiths.

The first piece of Canadian liturgical silver to enter the ROM collection was a resplendent monstrance by Amiot. It was sold to the ROM in 1937 by renowned Canadian ethnologist Marius Barbeau. Although its church of origin has not been identified, it does bear an early punch mark of Amiot's, "L.A." in a rectangle, suggesting a date of c. 1795–1805.

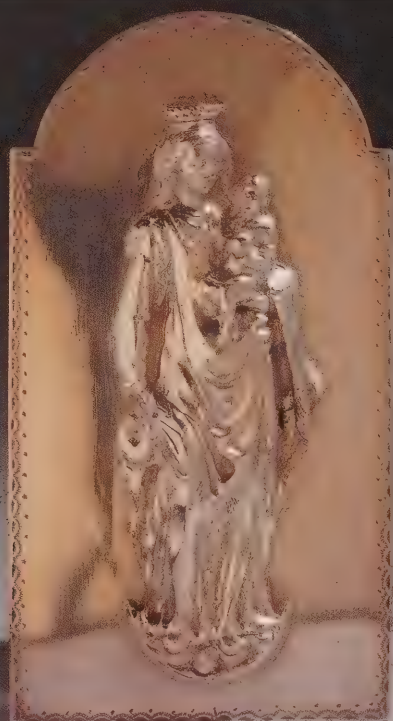
Usually, Amiot's monstrances are more sober. This quality is apparent in one of the ROM drawings, which illustrates a generic type that he repeated frequently. The framing element at the centre of the sunburst is circular and without

## Lost to History: A Liturgical Pax

A small liturgical artifact called a pax (or *instrumentum pacis*) was commonplace in Quebec churches during the 19th century. A plaque with a small handle at the back, the pax was held up by an acolyte so that it could be kissed by members of the congregation in what was a form of the "kiss of peace." This rite took place during Mass, just before communion. While the pax has a history going back to the Middle Ages, it had fallen into disuse by the early 20th century.

As a devotional image, the pax was not required to be made of any particular material, but Canadian examples of the late 18th and 19th centuries were commonly of silver—a sign no doubt of an increased general prosperity.

A pax in the ROM's collection made by Quebec City silversmith Laurent Amiot has an applied relief image of the Virgin Mary and Christ Child. It bears Amiot's early rectangular maker's mark. The type of image on this piece is referred to as the Immaculate Con-



BRIANN BOYLE, ROM / 960.139



embellishment. By comparison, in the ROM monstrance, the same element has an amorphous shape resembling a dense band of clouds from which rays radiate. Four cast angel heads are attached to this cloud-like framing structure.

All things considered, Amiot's liturgical silver is both derivative and innovative. His reliance on French sources, both old and new, is unequivocal, whereas the English factor is negligible. Though he relied on a recognized repertoire of designs and motifs, first and foremost he imparted clarity, temperance, harmony, and refinement in the whole and in the parts. In the end, he subscribes to classical artistic conventions, which ultimately descend from classical antiquity—but as filtered through the French artistic and religious experience of the 18th and early 19th centuries.

In the literature on Canadian silver there has been a tendency to misread the stylistic sources that inspired Laurent Amiot in that the Louis XVI factor is represented as dominating both his liturgical and his domestic production. While the Louis XVI style is certainly the strongest influence in Amiot's church silver, there is an older debt, to the Louis XIV style, as well as the occasional English element. The result is a very personal classicism, but always with a resolute French accent. His domestic work by comparison has a resounding Englishness. Amiot's success at stylistic synthesis is indicative of his creative genius.

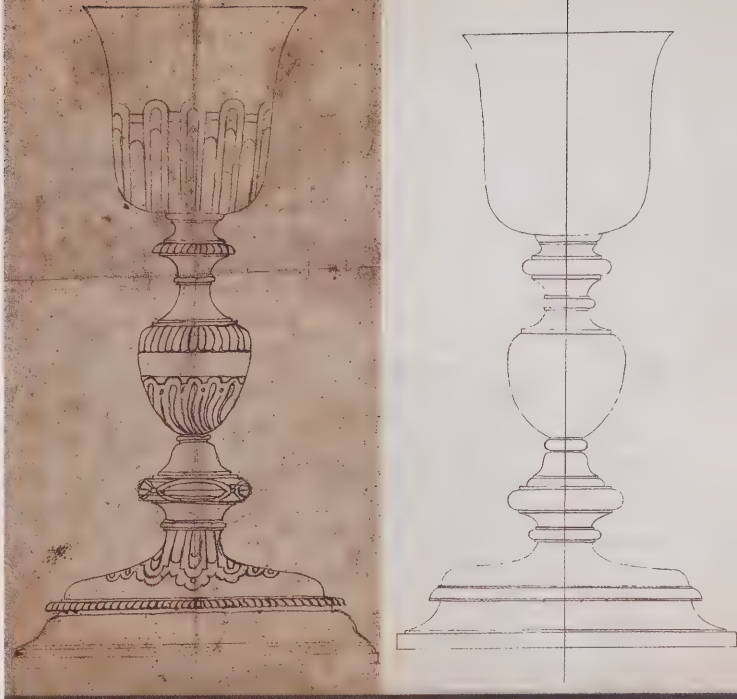
Following Amiot's death in 1839, his sons leased his workshop and tools to François Sasseville, who had worked as a journeyman silversmith under Amiot. Amiot also had a few apprentices over the years: Paul Morin, Jacques-Richard Filteau, Joseph Babineau, Pierre Rocheleau, and Pierre Lespérance. But it was Sasseville and Lespérance who carried on Amiot's legacy. Through them, and others, such as Ambroise Lafrance, Amiot had a resounding influence on the design of Quebec liturgical silver for nearly a century. ■

ception: Mary wears a crown, and has a crescent and serpent underneath her feet. It symbolizes the Roman Catholic doctrine that asserts that Mary was conceived free from original sin. That is, unlike the rest of humanity, she was free of a corrupt nature. Different versions of this image are found on colonial paxes.

Quebec City sculptor and painter François Baillairgé may have made the model for the image on the ROM's pax. Baillairgé's 1784–1800 journal provides a few insights into his working relationship with Amiot. Over time, he made six "Christs" of wood for Amiot. These served as models for making moulds for casting. Paxes often had a small relief image of the crucified Christ. Amiot made paxes of this type, but the models may also have been for crucifixes. A sculptor such as Baillairgé would also have supplied Amiot with models for small figural and decorative elements that were cast and applied to other liturgical articles.

BRIAN BOYLE, ROM / 948.279.22 / 948.279.23

MUSÉE NATIONAL DES BEAUX-ARTS DU QUÉBEC, PATRICK ALTMAN / 70.67.01; BRIAN BOYLE, ROM / 948.279.17.3



**Opposite page:** Ciborium, Laurent Amiot c. 1820–35. The Detroit Institute of Arts, Founders Society purchase, Robert H. Tan-nahill Fund. Pax, c. 1795–1805. Royal Ontario Museum.

**Above left:** Drawing of a chalice, undated. Royal Ontario Museum, Gift of the Yale University Art Gallery. **Above right:** Drawing of a chalice, undated. Royal Ontario Museum, Gift of the Yale University Art Gallery. **Below left:** Chalice for the Church of Saint-Martin, Chomedey, undated. Laurent Amiot. Silver and gold. 31.4 x 16.7 cm (12.2 x 6.5 inches). Musée national des beaux-arts du Québec. **Below right:** Drawing of a Chalice, c. 1801. The design for one of these chalices is actually repeated in three different drawings. Royal Ontario Museum, Gift of the Yale University Art Gallery. This drawing by Amiot of a chalice reproduces a design that was popular with French silversmiths during the early 18th century. A reeded calyx with scalloped openwork encases the lower half of the cup. The urn-shaped knob (knob) of the stem has gadrooning above and curved fluting below, and the smaller, lower knob, a reed-and-tie motif.





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## BACKYARD BIODIVERSITY

# ALL HANDS=ON DECK

*When Grade 4 students tackled helping species at risk,  
they inspired Museum staff to take action, too.*

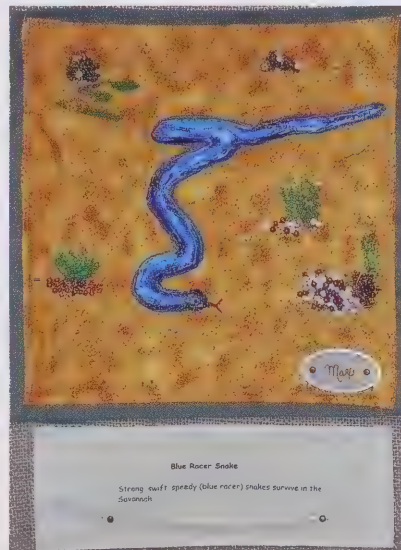
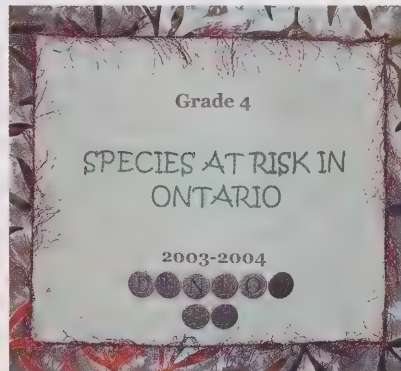
**Top:** Parents of Denlow Public School's Grade 4 class helped prepare a title tile for their class quilt. **Bottom:** One of the students chose to study the Blue Racer. Canada's only remaining population of this snake lives on Pelee Island in Ontario. The poem reads: Strong, swift, speedy (blue racer) snakes survive in the savannah.

**I**F YOU WANTED to help preserve biodiversity in your community, what would you do? The first step we all can take is to educate ourselves. The more we know, the more likely we are to make responsible choices in our everyday lives. Once we understand why biodiversity is important, what threatens it, and what can be done to help, it is time to take action.

Set an example through your choices, get involved in a community project, or try to find fun and interesting ways to tell others about what you've learned. You just may inspire friends and neighbours to educate themselves as well, generating a cycle of positive influence for the benefit of our environment.

In the Hands-on Biodiversity Gallery at the ROM, we are in the business of educating visitors about biodiversity and how the ROM takes action to preserve it through research and collections. Our hope is that through education we will motivate others and help to foster healthy relationships with nature.

Often though, the tables are turned and we are galvanized by the action of visitors and the stories they share. One particularly inspiring group of children, their teacher, and parents, educated themselves and



then took action, creating an effective medium to educate others about what they had learned.

The children were Grade 4 students at Denlow Public School. Their teacher, Francine Glube-Schwartz, was a volun-

Species-at-Risk web site. Already planning to be a teacher, Francine realized that this web site would be a valuable resource to her and her future students, and she has introduced it to her classes each year since becoming a teacher later that year.

Francine's class spent the 2003/2004 school year exploring environmental issues related to their curriculum. Students learned what an endangered species is and why wildlife sometimes cannot adapt to rapidly changing environments. They learned that plants and animals interact, and depend on one another for life. They learned, too, that humans depend on wildlife.

Inspired by this learning, they took action to help save biodiversity by participating in community efforts, such as the Yellow Fish Project. This venture puts children to work painting yellow fish symbols on storm drains to warn community members that toxins entering these drains will end up in the ecosystem, where they endanger fish and other wildlife and threaten our water supply. By all accounts the children did an excellent job of educating themselves and putting their knowledge to work.

But they did not stop there. In June 2004, Francine and her class wanted to finish the year with a major project that reflected some of the things they had learned. With limited time to learn and apply concepts from disparate lessons in subjects such as science, art, and poetry, Francine and her students knew they had to be creative. Francine came up with the idea of making a species-at-risk quilt.

### SHARILYNN WARDROP

teer facilitator in the ROM's Hands-on Biodiversity Gallery early in 2000, where she was introduced to the ROM's



Each of her students chose an endangered species in Ontario, created an image in the form of a quilt patch, and wrote a poem about the animal. The Royal Ontario Museum's Species-at-Risk web site provided Francine's students with important summaries of the animals' appearance and status, both of which were used to inspire these visual images and poetic expressions. The students applied their knowledge to create a quilt with a meaningful message, reflecting what they had learned about species at risk, poetry, and visual artistic expression.

To give a real-world application to their efforts, the students arranged to have their finished product displayed at the ROM. After many hours of planning, cutting, sewing, and embellishing, with the help of parent volunteers who sewed the quilt together, the children hoped they had created a product that would inspire and encourage others to protect Ontario's biodiversity. This beautiful quilt with poetic messages from all 23 students was displayed for two months in the ROM's Discovery Room.



As the students had hoped, their action inspired others. Staff and volunteers in the Hands-on Biodiversity Gallery decided they would try to generate even more discussion about species at risk by creating an activity asking gallery visitors to draw a species

at risk and write about what they can do to help. This informal request generated some of the most interesting and thoughtful artwork seen in the gallery. Kids drew all kinds of endangered animals and had a lot to say about how to protect species at risk. The exercise illustrated that young people are thinking deeply about the plight of endangered species.

The resulting artwork so inspired the staff and volunteers in the gallery that we saved our favourites and assembled them into a booklet, which is available in the gallery for others to see. The motivation and creativity of a small group of children has thus both directly and indirectly reached hundreds of other people.

Sharilynn Wardrop is the ROM's Hands-on Biodiversity Gallery and Discovery Room coordinator.

Sharilynn Wardrop is the ROM's Hands-on Biodiversity Gallery and Discovery Room coordinator.

## WHAT YOU CAN DO FOR BIODIVERSITY

### ■ EDUCATE YOURSELF

Read books and go for nature walks. A field guide to wildflowers, birds, or other wildlife can help to identify the plants and animals you see. Come visit the Hands-on Biodiversity Gallery and other nature organizations. Ask questions!

Here are some examples of web-sites that can help you find information about biodiversity or can give you ideas of places you can go to observe wildlife in your area:

- ROM Species at Risk [www.rom.on.ca/ontario](http://www.rom.on.ca/ontario)
- Environment Canada Hinterland Who's Who [www.hww.ca](http://www.hww.ca)
- Canadian Wildlife Federation [www.cwf-fcf.org](http://www.cwf-fcf.org)
- Local Conservation Authorities (you can find contact information for the

conservation authority in your area at [www.conservation-ontario.on.ca](http://www.conservation-ontario.on.ca))

- Ontario Parks [www.ontarioparks.com](http://www.ontarioparks.com)
- Parks Canada [www.parksCanada.ca](http://www.parksCanada.ca)

### ■ SET AN EXAMPLE

- Recycle, reduce energy consumption at home, or walk your kids to school.
- Try taking David Suzuki's Nature Challenge or Nature Challenge for Kids! [www.davidsuzuki.org/kids](http://www.davidsuzuki.org/kids)

### ■ DONATE

Money, supplies, or time as a volunteer are all excellent donations for an organization you believe in. The ROM or others listed here are good examples.

### ■ TAKE ACTION

Start a club, organize a cleanup, create a native plant garden, or plant trees in your community.

Here are some organizations to help you get started:

- Canadian Wildlife Federation [www.cwf-fcf.org](http://www.cwf-fcf.org)
- Evergreen Foundation [www.evergreen.ca](http://www.evergreen.ca)
- Federation of Ontario Naturalists [www.ontarionature.org](http://www.ontarionature.org)
- Roots and Shoots [www.janegoodall.ca](http://www.janegoodall.ca)
- Yellow Fish Road Project [www.yellowfishroad.org](http://www.yellowfishroad.org)

Write a letter to your local newspaper or politician supporting environmental education or asking them to enforce or create legislation to protect biodiversity.

An important way to take action is to *educate others* by finding creative ways to explain what you've learned.



# A HORSE OF A DIFFERENT COLOUR

*Bones and teeth of cows and horses are often exhumed in southern Ontario, but how do we know if they are from recent domestic animals or from their close Ice Age relatives? Colour is one of the clues.*

## Dear ROM:

WHILE DIGGING on my property, I exposed some bones buried in the ground. There are a lot of them (maybe the whole skeleton?), and the bones of the spine are still lying together in a row. They clearly represent a large animal. A local butcher said these bones were not those of a cow or a horse, so what could they be? How old are they? Could they be from a dinosaur?

JEFF ROSBOROUGH  
SOPHIASBURGH, ONTARIO

## Dear Jeff,

YOUR REQUEST IS TYPICAL of many we receive, and the answers to these questions are not always easy. But there is one thing of which we can be relatively certain: these remains cannot be those of a dinosaur. All the rocks in southern Ontario are either much too old (from the time period called Paleozoic, before dinosaurs had even evolved), or much too young (from the Ice Ages, long after the dinosaurs went extinct). In far northern Ontario there are some sediments of the correct age, but so far no fossil bones have been recovered from them.

Are your bones even fossils? Paleontologists define a fossil as either preserved remains or evidence of an organism. Your bones are clearly preserved remains of an organism, so they would qualify as fossils. While most people think of a fossil as something that has undergone some chemical change, or the process of fos-



silization, (expecting a fossil to be "petrified" or "turned to stone"), this is not necessarily the case. No one would argue that the bones from an extinct Ice Age animal are *not* fossils, yet some are so chemically unaltered that DNA can be extracted from them.

Your description piqued my curiosity, so I came to examine the bones in person. I suspected they might be those of a mammoth or mastodon, and well-preserved skeletons of these animals

Jeff Rosborough with the hip bones of his fossil find.

those of a horse. Although no skull has been recovered yet, the thighbone has a diagnostic shape, and can be from no other animal.

Without a carbon date, the age of your horse could be difficult to determine. This is a common challenge in southern Ontario: bones and teeth of cows and horses are often exhumed, but we don't know if they are from recent domestic animals or from their close Ice Age relatives. The bones of a bison are very similar to those of a cow, and the same can be said for horses: the extinct Ice Age horses of North America (more than one species is known) are superficially very similar

KEVIN SEYMOUR

are very rare in Ontario. But contrary to the opinion of the local butcher, I found that your bones were, indeed,

COURTESY PICTON GAZETTE





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to the recent domestic horse.

Trying to judge the age of a fossil by its look is a tricky endeavour. If preserved in bog, lake, or river sediments, or even in glacial tills, Ice Age fossils are often slightly mineralized, therefore heavier, and are usually somewhat stained. More recent bones are usually whiter and lighter. A bone that is accidentally broken during excavation can help, as the insides of these buried domestic animals' bones are still white, even if the outside is stained.

In this case, some of the bones were still in the ground, so I could see the context of your find. This helped a lot. I could see that the glacial sediments were below, and the horse bones were in the soil horizon at the top, with intertwined tree roots amongst them. This told me that the horse must be older than the trees, but younger than the glacial sediments, which suggested that the animal probably belonged to an early Loyalist settler, given the area, in Prince Edward County. We have coined a term to fill this grey area between a bone from last Sunday's dinner and those from the last Ice Age. We call these kinds of bones "sub-fossils," meaning that they are not mineralized, and probably not more than a couple of hundred years old.

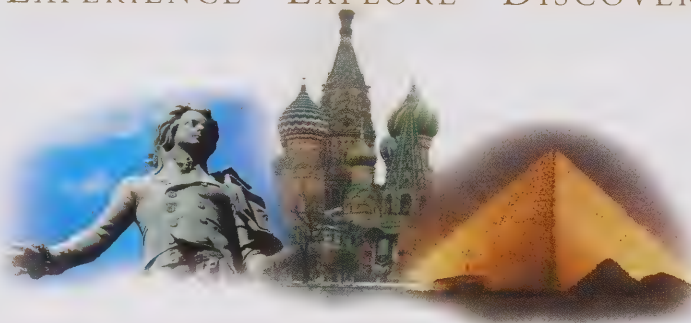
I could also see that due to the lay of the land, no one would have buried a horse far up on a steep hillside, and so this horse probably died at this spot and became buried naturally without being scavenged very much.

A carbon date could still be done, but it is rather expensive, usually in the order of \$700. Ironically, carbon dates on sub-fossils are often not very precise because of the large amount of carbon that has been pumped into the atmosphere over the last several centuries. This extra carbon can to some extent mask the true age of a bone, or make it look younger than it is.

Thank you for notifying us of your interesting find.

*Dr. Kevin Seymour is assistant curator of Paleobiology in the ROM's Department of Natural History.*

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## ROM ANSWERS

# TEA FOR TWO WORLDS

*Made in China, this handsome tea service—like many of its day—was intended for the Western market. But it is the accompanying tray that is most remarkable.*



BRIAN BOYLE, ROM

Directly above: M.D.'s tea service, repoussé and cast silver. Chinese export silver, c. 1900. Tea set, mark of Tu Quingyun, Jiujiang, Jiangxi Province. Tray, mark of Pao Kuang Co., location not known. Privately owned. L. (tray) 56 cm (21.8 inches). Left: Mark of Tu Quingyun, Jiujiang, Jiangxi Province, c. 1900, as struck on the bottom of the four-piece tea service. Right: Mark of Pao Kuang Company and Hong xiang as struck on the bottom of the tray.

### Dear ROM Answers,

WE BELIEVE that the silver tea service in the accompanying photo was made in China for the export market. In the 1930s, a family from Long Island, New York, was in the export business in what was then Nanking, China. When the Japanese invaded, their business was destroyed and they returned to their New York home. To raise money, they organized an auction and sold chances on some of their household items. My

parents were living in New York City at the time. My mother bought a number of chances on this tea service and won it. Ultimately, we inherited it and enjoy looking at it, although we

PETER KAELLGREN

don't use it. What can you tell us about our tea service?

M. D., TORONTO

### Dear Reader,

Thank you for your letter. Judging from the photographs, your tea service is an example of Chinese export silver, dating around 1900. The cast dragon handles are typical of this period. The diagonal lobes of low-relief decoration swirling around the bodies of the pieces are often found on silver tea wares and bowls made in China and India for the Western market in the period c. 1880–1910. The



**Top:** Comport, cast and repoussé silver. Chinese export silver, mark of Wang Hing, Hong Kong, c. 1900. H. 31 cm (12 inches). ROM Collection, gift of Norman S. and Marian A. Robertson. **Middle:** Three-piece tea service, silver. Chinese export silver, mark of Wang Hing, Hong Kong, c. 1900. H. (teapot) 10.9 cm (4.2 inches). ROM Collection, gift of Norman S. and Marian A. Robertson. **Second from bottom:** Coffee pot, silver with carved low relief. Chinese, made for the Western market, c. 1710. H. 15.5 cm (6 inches). ROM Collection, gift of Norman S. and Marian A. Robertson. A similar pot is in the Victoria and Albert Museum, London. **Bottom:** Bowl and cover, silver with decoration inlaid in gold and flat-chased. Chinese, T'ang Dynasty c. 750–800 C.E. Diameter 24.15 cm (9.4 inches). From the Collection of the Viscount and Viscountess Lee of Fareham, given in trust by the Massey Foundation to the Royal Ontario Museum.

kettle on a stand with alcohol lamp is also typical of the turn-of-the-century period when formal tea parties were part of the social scene. The kettle provides a ready supply of boiling water at the tea table and can be pivoted on the stand to pour fresh water into the teapot.

The asymmetrical tray with its cusped edge is an unusual form. I am delighted that you were able to bring these pieces in to the ROM for me to examine. The tray is of heavier gauge silver and shows finer workmanship than the tea service. The sprays of plum blossoms around the rim were individually cast and, through expert soldering, attached to the surface. The bird and tree patterns are skilfully impressed, or "flat-chased," into the surface using a technique that appeared much earlier in Chinese silver of the Sung Dynasty, c. 960–1279. The crescent shape of the tray reminds



993.53.301



993.53.302 1-3



993.53.293



997.128 1-2

me of several expensive European-designed ceramic and wooden trays from around 1880 that I have seen in England. Your tray may have been inspired by a contemporary piece of French silver that was imported into China.

The difference in the design and workmanship of the tea service and the tray is also apparent in the marks. All four pieces of the tea service are struck on the bottom with Chinese characters forming an oblong seal mark. Kang-mei Wang, technician in the ROM's Far Eastern Library, was able to translate the marks on both pieces. The tea service bears the mark of Tu Quingyun of Jiujiang, a city in Jiangxi Province. The tray is marked "PAO KUANG CO[MPANY]" in European lettering and, in a separate seal mark, "Hong xiang," indicating that it came from a large commercial establishment somewhat like a Birks store.

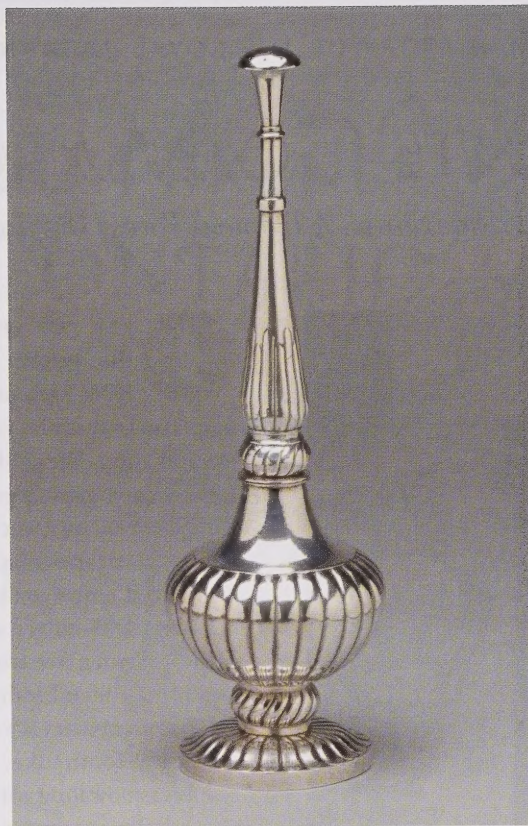
The history of gold and silver work in China goes back many centuries. Examples dating earlier than 1700 are scarce because precious metals were often melted down. This was not the case for bronze and iron articles, which survive in greater quantities. The Royal Ontario Museum owns two early silver examples and would like to acquire more. The two are part of the Lee of Fareham Collection, which came to Toronto in 1947. The oldest piece, dated to as early as the T'ang Dynasty (c. 800 C.E.), is a silver bowl and cover with flowers inlaid into the surface in gold. The second item, a pin, is a gold filigree male phoenix or "feng" mounted with cabochon rubies and natural pearls. While recently researching the Lee Collection in England, I discovered that this pin came from the tomb of



the Chinese Emperor Xuande, who reigned from 1426 to 1435. John Sparks Limited, a famous London dealer in Chinese art, offered two of these pins for sale in 1939. Viscount Lee bought one of them. They were part of a series that ornamented the Emperor's hat. Fine silver and gold filigree were commonly produced in China, primarily for jewellery and hair ornaments, though some boxes and other articles were made using the technique.

During the 1800s, many workshops were established in China, particularly in the various port cities, to make Western-style silver. The price was very attractive to foreigners because, although silver bullion cost about the same as in their home countries, labour was considerably less expensive and was often very skilled. Decoration and finishing were done by hand, and, following Chinese taste, the silver was usually of sterling (92.5% pure) or higher standard. Often the pieces copied forms and decoration that were currently popular in British silver. Sometimes they followed continental and other models, as in the ROM's tall rosewater sprinkler made for the Indian and Middle Eastern markets.

Towards 1900, decoration became increasingly Chinese in style. Hence the dragon handles on your tea service and the "bamboo" stand for the kettle. Judging from a wide range of



993.53.295



991.30.4

**Top:** Rosewater sprinkler, silver. Chinese, made for the Indian and Middle Eastern market. Struck with the mark of Linchong or Lynchong of New China St., Canton, c. 1800–1825. H. 28.9 cm (11.2 inches). Mr. Robertson purchased this in Alexandria, Egypt. ROM Collection, gift of Norman S. and Marian A. Robertson. **Bottom:** Miniature Chinese chair, silver. Chinese export silver, mark of Wang Hing, Hong Kong, c. 1900. H. 5.1 cm (2 inches). ROM Collection, museum purchase.

surviving pieces, one of the most prolific workshops from the c. 1900 period was that of Wang Hing, 10 Queen's Road, Hong Kong. Many Chinese export silver tea services survive from the period c. 1880–1940. Most are rather modest three-piece sets with the teapot having a capacity to serve at most four people. I have seldom seen trays.

The American provenance of your tea service does not surprise me. Americans were very active in export, commerce, education, and missionary work in China. Even today, the primary market for Chinese export silver is the United States. Tea services and larger examples of Chinese export silver are probably worth appraising for insurance purposes; small pieces, however, can still be reasonably priced. Thank you for sharing your family heirloom with our readers.

*Peter Kaellgren is curator of European Decorative Arts in the ROM's Department of World Cultures.*

BRIAN BOYLE, ROM

## WE'D LIKE TO HEAR FROM YOU

If you own furniture, silver, glass, metalwork, ceramics, textiles, or small decorative objects that may have an interesting past and have aroused your curiosity, this column is for you. Send a clear colour photograph (or 35-mm colour slide) of the object against a simple background, providing dimensions, a description, any markings, or any known details of its history to: ROM Answers, c/o *Rotunda* magazine, Royal Ontario Museum, 100 Queen's Park,

Toronto, Ontario M5S 2C6. Be sure to enclose a stamped, self-addressed envelope large enough to include any photos that must be returned to you.

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Letters will be acknowledged as staff time permits.



# THE ANTS GO MARCHING

*That '60s Show: A Tropical Forest Display.*



ROM ARCHIVES

**O**VER THE YEARS—and into the future, we hope—the ROM has won renown for its displays. In this photograph dating to around 1962, Terry Shortt (left) and Levi Sternberg, two legendary museum staffers, are shown working on a device for a tropical forest display. They built a motorized conveyor belt that would simulate leaf-cutter ants in convoy coming down a tree trunk (while their ascent has been hidden inside). The leaf fragments they are carrying are realistically tooth-like. Although this display is now long gone, ROM scientists continue to work in tropical zones and bring back specimens.

Shortt, himself an artist, appears to be holding a copy of *National Geographic* for reference. Sternberg, who belonged to an acclaimed dinosaur-hunting family that made many finds in the '20s and '30s, enjoyed a long career making moulds for gallery specimens of all kinds. According to curator emeritus Dr. Glen Wiggins, whom I asked for help in dating this image, some of Sternberg's latex moulds were made using living snakes that had been anaesthetized. As Wiggins recalls, one began to revive in the freight elevator, destroying the mould as well as the "sang-froid" of staff!

JULIA MATTHEWS

*Julia Matthews is head of the ROM's Library and Archives.*



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